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DUBLIN
EXAMINATION PAPERS:

DESCRIPTIVE

A Supplement

TO THE

UNIVERSITY CALENDAR

FOR THE YEAR

1864.



DUBLIN:

Printed at the University Press.

HODGES, SMITH, & CO., GRAFTON-STREET.

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LONDON: LONGMAN, GREEN, LONGMAN, ROBERTS, & GREEN.

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DUBLIN :

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DUBLIN EXAMINATION PAPERS, 1862-1863.

Michaelmas Term, 1862.

JUNIOR FRESHMEN

Entrance Prizes in Composition.

GREEK PROSE.

MR. ABBOTT.

Subject for Greek Prose Composition.

**"The comparative excellence of the Constitutions of Athens
and of Sparta."**

MR. STACK.

Translate the following passage into Greek Prose:—

Beginning, In the meantime, also revolted Mende, a city in Pallene, . . .

Ending, as expecting that the Athenians would soon be with them.

From a Translation of Thucydides.

DR. INGRAM.

Translate the following passage into Greek Prose:—

Beginning, That there should be such men among us, ...

Ending, you are destined speedily to struggle for your very existence.

BROUGHAM, from Demosthenes.

GREEK VERSE.

DR. INGRAM.

Subject for Greek Verse Composition.

Imagine a Greek, who had travelled in Egypt, describing to a fellow-countryman (about 500 B. C.) the natural scenery, temples, monuments, &c., of that country.

Write, in Greek Trimeter Iambics, such a description as he may be supposed to have given.

MR. STACK.

Translate the following passage into Greek Trimeter Iambics:—

Beginning, To be the chief of honourable men

Ending, But he they served,—he is not what he was.

TAYLOR'S *Philip van Artevelde*.

MR. ABBOTT.

Translate the following passage into Greek Heroic Hexameters:—

Beginning, For man to tell how human life began

Ending, Whate'er I saw.

MILTON, *Paradise Lost*, b. viii. 250-274.

LATIN PROSE.

MR. STACK.

Subject for Latin Prose Composition.

Write a distinct account, and in some detail, of the several stages in the subjugation of Italy by the Romans.

DR. INGRAM.

Translate the following passage into Latin Prose:—

Beginning, The Carnatick is refreshed by few or no living brooks or running streams, ...

Ending, the guardians, the protectors, the nourishers of mankind.

BURKE.

MR. ABBOTT.

Translate the following passage into Latin Prose:—

Beginning, In the second place, if we look upon the toils of ambition, ...

Ending, if the pains they undergo do not outweigh their enjoyments.

SPECTATOR, No. 624.

LATIN VERSE.

Subject for Latin Verse Composition.

"The Election of Prince Alfred to the Throne of Greece."

MR. STACK.

Translate the following passage into Latin Hexameters:—

Beginning, To bend the arch, to bid the column rise, ...

Ending, Her comic sister lightly danced along.

CANNING'S *Greece*.

DR. INGRAM.

Translate the following passage into Latin Lyric Verse:—

Beginning, Descend, ye Nine! descend and sing;.....

Ending, To arms, to arms, to arms!

POPE.

Prizes in English History and Modern Geography.

ENGLISH HISTORY.

PROFESSOR BARLOW.

1. Who was the first Count of the Saxon Shore? Date of his appointment? What became of him? What different theories have been held respecting the nature of this office, and for what reasons?

2. Relate anything you know of the life of Athelstane. In particular, name the foreign princes to whom his sisters were respectively married.

3. Draw out genealogical tables, showing (a) the descent of Edmond Ironside from Alfred; (b) the descent of Henry IV. from Henry III., both by the father's and the mother's side; (c) the descent of Cardinal Reginald Pole from Edward III.

4. Give the dates of the following events:—The banishment of Godwin; the battle of Brunanburg; the Hallelujah victory; the death of Ethelwulf; the battle of Pinkie; the insurrection of Jack Cade; the execution of Joan Darc; the battle of Najara; the death of Simon de Montfort; the murder of Darnley.

5. Give some account of the Statutes of Præmunire.

6. In what respects is the history of England connected with that of the Netherlands during the reign of Elizabeth?

7. Who was (a) Peter des Roches; (b) John (Sans peur), Duke of Burgundy; (c) Cardinal Beaton?

8. Hume speaks of the year 1519 as forming a kind of era in the general system of Europe; write a short historical essay on this remark.

DR. INGRAM.

9. Give an account of the event commemorated on the 24th of August last by some of the Protestant Dissenting bodies. What provisions of the Act of Parliament which led to that event are still in force?

10. When were the following principles established:—

a. Independence of the judges;

b. Immunity of juries for their verdicts;

c. That a royal pardon is not pleadable in bar of an impeachment?

11. Write short biographies of Harley, Earl of Oxford; and St. John, Viscount Bolingbroke.

12. Give a full account of the transactions arising out of the publication of No. 45 of the "North Briton."
13. State the principal provisions of the Scottish and Irish Union Acts.
14. Relate briefly the history of the Peninsular War.
15. When, and how, did England acquire the following possessions:—Bombay, Canada, Cape of Good Hope, Gibraltar, Heligoland, Hong Kong, Ionian Islands, Jamaica, Labuan, Malta, Newfoundland?
16. Set out in order, with their dates, the most important events in the history of British India.

GEOGRAPHY.

DR. INGRAM.

1. In what counties of Great Britain or Ireland are the following places severally situated:—Abbotsford, Clarendon, Edgehill, Eton, Glencoe, Killiecrankie, Marston Moor, Northallerton, Soane, Stonehenge, Windsor?
2. Set out in a map the fourteen Midland Counties of England; and mark the important towns contained in them.
3. In what counties are the following mountains and lakes situated:—Cader Idris, Helvellyn, Mangerton, Snowdon; Derwentwater, Ulawater, Whittlesea Mere, Loch Tay, Loch Awe, Loch Katrine, Loch Leven?
4. Enumerate, as completely as you can, the towns which lie along the course of the Chester and Holyhead and London and North-Western Railways.
5. Give a general view of the physical geography of Hindustan; also of its ethnology, and of the languages and religions of its inhabitants.
6. Describe the Overland Route. Compare the advantages of the several proposed modes of shortening the European transit to India.

MR. BARLOW.

7. Name in order the French maritime departments from Dunkirk to Bayonne.
8. Where are the following places, and for what events are they respectively remarkable:—Calmar, Campo Formio, Dettingen, Lepanto, Lützen, Morat, San Sebastian, Saratoga, Tilsit, Vimeira?
9. Sketch the outline of the shores of the Mediterranean Sea.
10. Draw a map of the Confederate States of North America.
11. Name, and describe the localities of, as many mountains as you can which are more than 10,000 feet high.
12. Where are the following places:—Algarve, Almeria, Cambodia, Ceram, Gallipoli, Halle, Herat, Naxos, Monte Rotondo, Rosekilda, Salzburg, Sarmen, Thiaka, Viterbo, Zutphen?

Prizes in English Literature and Composition.

ENGLISH LANGUAGE.

MR. BARLOW.

1. Give a short analysis of the language of the Brut of Layamon in respect of etymology and syntax. What is the date of this composition, and to what stage of the language does it belong?

2. Translate the two following passages into English; name the works from which they are taken, and write short explanatory notes on any obscure expressions or constructions:—

- a. "Arthur mid his sweorde : fæie-scipe wurhte :
 Al that he smat to : hit wes sone fordon :
 Al was the king abolgen : swa bith the wilde bar :—
 Tha isæh Arthur : athelst kingen :
 Whar Colgrim at-stod : and æc stal wrohte :
 Tha clupede the king : kenliche lude :"

b. "Tha namen hi tha men the hi wenden thæt ani god hefden. Me dide strenges abutan here hæved, and writhen to thæt it gæde to the hærnas."

3. What was the fate of the Anglo-Saxon tongue in Scotland? What attempts have been made to account for this, and with what success?

4. Point out the moral lessons which may be derived from the following words:—*ἡνικαιρεκακία*, *ὑποκοπιζέσθαι*, innocent, talents, assentator, dénigreur, happy, virtuoso, self-sufficient, *αὐράρκης*.

5. Explain the italicized words in the following passages:—

- a. "And, after all, for greater infamy
 He by the heels him hung upon a tree,
 And *baffled* so, that all which passed by
 The picture of his punishment might see."

b. "Spartacus gave them battle, overthrew them, and took all their *carriage*."

c. "Oh the *painfulness* of his preaching!"

d. "The sovran *treacle* of sound doctrine."

e. "A lamentable case that the devil's *black guard* should be God's soldiers."

6. Give the derivations of—anchor, anecdote, apoplexy, black, blue, bottle, check, cobbler, cobweb, stranger.

ENGLISH LITERATURE.

PROFESSOR INGRAM.

I.—1. Name and describe the several Pilgrims introduced in the Canterbury Tales of Chaucer.

2. Show that the poetic life of Shakspeare may be divided into three periods, presenting distinct characters. Name the chief Dramas belonging to each period.

3. Give an account of the principal works of Roger Ascham. State the substance of the two passages from his writings, noticed by Spalding as "deserving special remembrance."

4. By whom, and about what time, were the following poems written:—"Christabel," "Manfred," "The Medal," "The Bruce," "The Pleasures of Hope," "The Pleasures of Memory," "The Pleasures of Imagination," "The Pastime of Pleasure," "Thalaba," "London," "The Story of Thebes," "Evangeline," "The King's Quair"? Give an account of the subject and plan of any one of them.

5. Name the authors of the following plays: "Douglas," "She Stoops to Conquer," "Venice Preserved," "The Alchymist," "The Fatal Dowry," "Irene," "The Sad Shepherd," "Samson Agonistes."

6. By whom, and about what time, were the following prose works written: "Essay of Dramatic Poesy," "The Complete Angler," "The Man of Feeling," "The Diversions of Purley," "Memoirs of a Cavalier," "The Golden Grove," "The Worthies of England," "History of Charles the Fifth," "Essays of Elia"?

7. Give the dates of the following events: the death of Chaucer; the birth and death of Shakspeare; the publication of the Authorized Version of the Bible; the appearance of "Paradise Lost;" the death of Dryden; the commencement of the "Spectator;" the publication of "Waverley;" the deaths of Byron, Scott, and Wordsworth.

8. Explain the allusions in the following sentences, which occur, or are quoted, in Spalding's History:—

a. "His [Cædmon's] dreamsong is more coherent than Coleridge's verses of similar origin."

b. "Every reader of poetry has by heart the description of Iphigenia asleep."

c. "Where grateful Science still adores
Her Henry's holy shade."

d. "The Scottish pastoral drama of Ramsay need not be more than named."

e. "It has been said that Pope never tried to be pathetic except twice."

II.—1. What discrepancy is there between the plays of "Henry the Sixth" and "Richard the Third" in relation to the first husband of the wife of Edward the Fourth?

2. "What think you of the Scottish lord, his neighbour?" (Mer. of Ven. i. 2). How does this stand in the first Folio? and what was the reason of the change?

3. "Ev'n at the base of Pompey's statue." Comment on the metre of this line, and quote from "Richard the Third" a verse which throws light on it.

4. Explain the following passages, commenting particularly on the italicized words:—

a. "Sweet saint, for charity, be not so *curst*."

- b. "Take heed you *dally* not before your king."
 c. "As well the fear of harm, as harm *apparent*,
 In my opinion, ought to be prevented."
 d. "If I had been *remember'd*,
 I could have given my uncle's grace a flout."
 e. "Tell him his fears are shallow, without *instance*."
 f. "The *precedent* was full as long a doing."
 g. "Seduc'd the pitch and height of his degree
 To base declension and loath'd *bigamy*."
 h. "Ah, Buckingham, now do I play the *touch*."
 i. "Because that, like a *Jack*, thou keep'st the stroke
 Betwixt thy begging and my meditation."
 j. "Decline all this, and see what now thou art."
 k. "Fill me a bowl of wine,—give me a *watch*."
 l. "And other ventures he hath, *squandered* abroad."
 m. "This aspect of mine
 Hath *fear'd* the valiant."
 n. "Tell me, where is *fancy* bred?"
 o. "The *continent* and summary of my fortune."
 p. "You stand within his *danger*, do you not?"
 q. "The quality of mercy is not *strain'd*."
 r. "An I had been a man *of any occupation*."
 s. "Oh, name him not, let us not *break with* him."
 t. "They mean to *warn* us at Philippi here."
 u. "The *secret* top
 Of Oreb or of Sinai."
 v. "Some small *night-founder'd* skiff."
 w. "The *rebel king*
 Doubled that sin in Bethel and in Dan."
 x. "The *Dorian mood*
 Of flutes and soft recorders."
 y. "Belike through *impotence*, or unaware."
 z. "Wing silently the *buxom* air."

5. In what peculiar sense does Shakspeare sometimes use the following words: airy (*or* eery), competitor, engross, envy, heap, nephew, niece, obsequiously, prefer, remorseful?

6. How does Milton pronounce the words "emptyreal" and "empty-rean"?

Subjects for English Composition.

MR. BARLOW.

1. Knowledge is power.

2. *Credunt homines rationem suam verbis imperare. Sed fit etiam ut verba vim suam super intellectum retorqueant et reflectant.*
3. The last expedition of Garibaldi.

DR. INGRAM.

1. The effects, immediate and ultimate, of the Protestant Reformation on English literature.
2. A comparison of the English and French dramatic systems.
3. The general character of the nineteenth century, as a literary period.

Candidates will select one subject from each of the groups given above.

EXAMINATION FOR DEGREE OF MASTER IN SURGERY.

Michaelmas Term, 1862.

PROFESSOR SMITH.

SURGERY.

1. Enumerate the symptoms of organic stricture of the rectum.
 2. Describe the disease termed "fissure of the anus." What was Boyer's opinion as to its nature? What application was recommended by Dupuytren? Is there any caution necessary, when the sphincter is divided for the cure of the disease?
 3. Treatment of pruritus of the anus?
 4. Describe fully "Jacob's ulcer," and trace it to a fatal termination.
 5. Characters of the "warted ulcer;" its nature and treatment?
 6. Describe the progress and termination of chronic orchitis. Give the local and constitutional treatment. What is the nature of the deposit in the body of the testis?
 7. Operation for tying the second stage of the subclavian artery, and its dangers?
 8. Under what circumstances has it been proposed to perform laryngotomy in cases of suicidal wounds of the throat?
 9. Mention the characters and nature of "epulis."
-

SURGICAL PATHOLOGY.

1. What are the characters of the three forms of hypertrophy of bone enumerated by Lobstein?
2. Who first made mention of phlebolites? Describe their mode of origin, and their chemical composition.

3. Mention the anatomical characters of the bones in the different stages of rickets.
 4. What is meant by "rachitic consumption"?
-

CHEMISTRY.

DR. APJOHN.

1. A test has been proposed for distinguishing between fibrin and coagulated albumen; what is it?
 2. How would you examine blood for urea?
 3. What are the characters of diabetic urine?—what the composition of the sugar contained in it, and the best chemical process for ascertaining its amount?
 4. In a mixed urinary sediment, consisting of lithic acid, lithate of ammonia, lithate of soda, and lithate of lime, how would you determine the amount of each?
 5. An astringent lotion is sometimes made with a mixture of alum and sulphate of zinc; how would you prepare such solution so that, upon passing into it sulphide of hydrogen, the zinc would be precipitated?
 6. In normal urine, oxalic acid gives a mixed precipitate, consisting of two distinct materials; what are these, and how is the amount of each determined?
 7. Explain the reactions which occur when silver and when bismuth are dissolved in nitric acid.
 8. There is a caustic used by surgeons which, upon contact with water, is decomposed; what is its name, how is it made, and how does water act upon it?
 9. How would you ascertain whether chloroform includes spirit?
 10. How is absolute alcohol prepared?—and how is it ascertained that it is entirely free from water?
-

UNDERGRADUATE HONOR EXAMINATION PAPERS.

Hilary Term, 1863.

SENIOR SOPHISTERS.

Ethics.

ARISTOTLE AND BUTLER ON THE NATURE OF VIRTUE.

MR. POOLE.

1. Τὰς δ' ἀρετάς λαμβάνομεν ἐνεργήσαντες πρότερον, ὥσπερ καὶ ἐπὶ τῶν ἄλλων τεχνῶν.

The words ἐπὶ τῶν ἄλλων τεχνῶν seem opposed to Aristotle's views. Show this; and state how they are to be interpreted.

2. Aristotle seems to assert great doubtfulness in matters connected with morals. Notice the passages which prove this. Yet he appears in other passages to have a belief in some fixed standard of morality?

3. Περὶ ἡδονᾶς γὰρ καὶ λύπας ἐστὶν ἡ ἠθικὴ ἀρετή.

Give Aristotle's arguments in support of this statement.

4. Ἀπορήσει δ' ἂν τις πῶς λέγομεν ὅτι δεῖ τὰ μὲν δίκαια πράττοντας δικαίους γίνεσθαι, τὰ δὲ σώφρονα σώφρονας· εἰ γὰρ πράττουσι τὰ δίκαια καὶ τὰ σώφρονα, ἤδη εἰσὶ δίκαιοι καὶ σώφρονες.

Discuss this paradox; and state distinctly Aristotle's views on the subject.

5. Aristotle omits some virtues from his induction which would appear inconsistent with his definition of ἀρετή?

6. Show by examples that *either extreme*, whether in *excess* or *defect*, may be the least opposed to the *mean*.

It has been remarked, however, that both cases seem determined in accordance with the same principle?

7. What view does Butler take of pain and suffering as existing in this world? And state your own arguments in respect to that view.

8. Whence does it arise that one class of actions, regarded as of *good desert*, is less recognised than the other?—and how does Butler explain the circumstance that causes it?

9. Butler, in passing, removes a charge frequently brought against religion in a way that seems very conclusive?

STEWART AND SMITH.

DR. DICKSON.

1. Write upon "the Desires" as parts of an Ethical system.
2. State Stewart's arguments, as distinct from Butler's, for the existence of a moral faculty; and add such suggestions as may occur to yourself.
3. Give the arguments *a priori* and *a posteriori* for the existence of God, and criticize them.
4. Sketch an outline of Plato's ethical system, with especial reference to the place occupied in it by the governing faculty.
5. Enumerate the various senses in which the word "justice" was used by the ancient philosophers.
6. How were the Stoics led to form the character of their ideal wise man?—and state what that character was.
7. Write an account of those systems which make virtue consist in prudence.

DR. MALET.

1. Butler says that vice consists chiefly in the absence of the virtuous principle. Explain this fully; and reconcile it with his definition of vice, that it is the "violation of the relations in which God has placed us."
2. In what different senses might the precept be taken, to love our neighbour as ourselves? How does Butler discuss the objections made to it as implying an equality of affection?
3. "Happiness does not consist in self-love." State, in full, Butler's remarks on this.
4. "Morals, considered as a science, require a very peculiar attention." Explain this accurately.
5. In what two ways may the subject of morals be treated? What are the advantages of each? Show how Butler principally proceeds in the second way.

Experimental Physics.

PHYSICAL GEOLOGY.

PROFESSOR HAUGHTON.

1. What were Werner's principal divisions of rocks? Show that the geologist is not justified in assuming any existing rocks to be those which originally constituted the solid part of the earth.
2. Show that the climate of Europe has, at a former period, been very much colder than at present; and that this may be accounted for without supposing any different external conditions of our planet.

3. State concisely the plan you would adopt in order to ascertain the geological structure of some new locality.
 4. State concisely proofs of elevation and depression of land, and mention examples in different parts of the world.
 5. Explain fully, and with examples, the grounds of the three great divisions of stratified fossiliferous rocks.
 6. Define gneiss, porphyry, syenite, grauwacke, tuff, travertin. How are igneous rocks usually distinguishable from aqueous? Explain how the age of igneous rocks may be determined, and illustrate by any actual cases which may occur to you.
 7. Give an account of Mallet's theory of earthquakes.
 8. What is the mean density of the earth? Explain how this is established. What is that of the external crust, so far as we are acquainted with it? What is there to account for the difference?
 9. Explain the terms, *lamination* and *foliation*. How do you account for the lamination of some aqueous deposits, and the absence of this character in others? Give examples.
 10. What proofs are there of the former occurrence of a "glacial period" in this part of the earth? What means have we of ascertaining the (geological) date of this period?
 11. What proofs have we of changes of climate in this country in former times? Draw a diagram showing the direction of the principal Atlantic currents, and point out how they affect at present the climate of this country.
 12. What is the composition of the magnesian limestone, and where is this formation found in Great Britain?
 13. What is the nature of glaciers, and the effects they have produced on the surface of the earth?
 14. Explain the action of ice as a transporting power. What proofs have we of the existence of a much colder climate in our island at no very remote geological epoch?
 15. Describe the phenomena of the boulder drift of Northern Europe. Appeal to causes now observed to be in action to account for it.
 16. Explain the origin of springs; also the construction of an Artesian well, and the conditions necessary to the success of such a well.
 17. Define *denudation*. Give some proofs of the extent to which this has contributed to the present external state of the earth. Explain how the action of aqueous agencies would tend to bring the earth to its present figure, whatever its original figure might have been.
 18. Explain the relation between the occurrence of water springs and faults, and different kinds of strata.
 19. What is an Artesian well? Describe the geological conditions under which Artesian wells are most available.
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HEAT AND ELECTRICITY.

MR. GALBRAITH.

1. From the ordinary barometric formula for calculating the height of a mountain, prove that the following is nearly correct for the height in feet:—

$$\text{Height} = 52000 \times \frac{h - h'}{h + h'}.$$

2. From this deduce the difference of height of two stations near the sea-level, which corresponds to a difference of 1° F. in the boiling-point of water; assuming the temperature of the air to be 60° F., and 27 millimetres to be the difference of pressures for 99° and 100° C.

3. What are the definitions of the boiling-points on the Fahrenheit and Centigrade scales? To what point on the Centigrade scale does 212° F. correspond?—and what is the exact ratio between Centigrade and Fahrenheit degrees?

4. Prove that the product of the volume and elastic force of a given mass of gas is proportional to its absolute temperature.

5. A glass jar, whose section is 8 inches, contains over a water-bath 100 cubic inches of a gas saturated with moisture at a temperature of 122° F. ($f = 3.62$), the atmospheric pressure is 30 inches, and the water of the bath stands at the same level inside and outside the jar. If the temperature fall to 59° F. ($f = 0.50$), the atmospheric pressure remaining the same, calculate the height which the water will rise to in the jar, neglecting its own weight.

6. What will be the position of stable equilibrium of a pair of crossed magnets under the Earth's influence?

7. Give a construction for finding the magnitude and direction of the resultant force of the poles of a magnet on a distant point.

8. What is the law of the dissipation of electrical force in an insulated conductor? Give the expression for the force after the lapse of t minutes.

9. Explain the manner in which electricity is accumulated by Volta's condenser.

10. State some of the experiments by which it is proved that the positive electric condition of the atmosphere increases as we proceed upward.

 DR. APJOHN.

HEAT.

1. If e be the coefficient of the lineal expansion of a solid for t degrees, what will be the value of its coefficient of cubic expansion for one degree?

2. If a rod of copper laid on a longer one of platinum be connected to the platinum by a rivet at their common extremity, and if such a heat is applied as causes the copper rod to move forward relatively on the platinum rod by $\frac{1}{16}$ th of an inch, what is the rise of temperature which both

c

must have experienced; the lengths of the copper rod at 32° being l , and the coefficients of expansion of platinum and copper being 0.000055, and 0.0000106, respectively?

3. If in a weight thermometer P be the weight of mercury filling ball and tube at 32° , and m the weight of mercury expelled by placing it in an oven, what has been the temperature of the oven?

4. If a weight thermometer contains at 32° P grains of a liquid, and if, at t , p grains are expelled; what is the coefficient of the cubic expansion of the liquid, k being that of glass?

5. Explain Dulong and Petit's method of finding the coefficient of the expansion of mercury.

6. A mass of air saturated with vapour has, at 60° , and under a pressure of 28.79 inches of quicksilver, the bulk of 84.37 cubic inches; what would its volume be if quite dry at temperature 38° , and pressure of 30?

N. B.—Force of vapour at $60^{\circ} = 0.61$.

7. How do you express the law of Mariotte so as to take into consideration the effect of temperature as well as pressure upon volume?

8. What is the simple method of comparing the specific heats of two bodies suggested by the law of cooling given by Newton?

9. The relation, according to Wœstyn, between the specific heat of a compound and the specific heats of its components is a very simple one. What is it?

10. If 2 lbs. of iron, 3 lbs. of mercury, and 5 lbs. of silver, all at 212° , be thrown into 6 lbs. of water at 40° , what common temperature will the metals and water assume?

CHEMISTRY AND CRYSTALLOGRAPHY.

1. What is the rule of Berthollet for foretelling decompositions?

2. Explain the action of oil of vitriol on bichromate of potash, and calculate the volume of oxygen which one pound of the salt is capable of yielding.

3. What are the results of the action of muriatic acid on the red oxide of mercury, and on the black oxide of manganese?

4. How is the bleaching salt of lime made; what is its composition, and what the action of muriatic acid upon it?

5. Assuming liquid muriatic acid of specific gravity 1.16 to have the formula $\text{HCl} + 3\text{HO}$, what weight of this acid may be obtained from 16 ounces of chloride of sodium?

6. What is the chemical composition of the preparation which is obtained by passing sulphide of hydrogen into solution of ammonia as long as the gas is absorbed? and what the precise actions exerted by this preparation when it is added to a solution of sulphate of copper, and to a solution of sulphate of manganese?

7. What course would you take for the purpose of ascertaining whether a natural water includes nitrates?

8. Give the respective actions of dilute sulphuric acid, of dilute nitric acid, and of muriatic acid on metallic iron.

9. Write a complete list of the oxides of sulphur, and explain the processes by which the dithionic and tetrathionic acids are prepared and insulated.

10. What are the volumes of oxygen necessary for the complete combustion of a single cubic inch of the following gases, viz., hydrogen, carbonic oxide, marsh gas, and olefiant gas?

11. What is the name, and what the notation, of the compound form bounded by eight equilateral triangles and six squares?

12. Mention the hemihedral forms of the first system with parallel, and those with inclined faces; and give the notation of each.

13. What simple form of the third system, and compound form of the fourth system, are very similar to each other? State also how they may be distinguished.

14. The hydrated sulphate of lime, or gypsum, sometimes occurs as a flattened four-sided prism, with oblique dihedral terminations; what is the notation of the different faces of this compound form?

History, Political Science, and English Literature.

ENGLISH LITERATURE.

PROFESSOR INGRAM.

1. Explain the italicised words in the following quotations from Shakespeare:—

- a. "When we have shuffled off this mortal *coil*."
- b. "There's the *respect*
That makes calamity of so long life."
- c. "Virtue itself of vice must pardon beg,
Yea, *curb* and woo, for leave to do him good."
- d. "*Defeat* thy *favour* with an usurped beard."
- e. "To scant my *sizes*."
- f. "Bless thee from whirlwinds, star-blasting, and *taking*."

2. The following quotations are given as in the first Folio; what are the readings in the Quartos?—

- a. "The inobled queen."
- b. "Thy face is valiant, since I saw thee last."
- c. "There with fantastic garlands did she come."
- d. "Yet here she is allow'd her virgin rites."
- e. "Wherein the tongued consuls can propose
As masterly as he."
- f. "Not of the eye which their investments show."

3. "Of God, or hell, or worse
He reck'd not, and these words thereafter spake."

What is meant by *thereafter* in this sentence of Milton? Quote any other passages where it bears the same sense.

4. From what poems are the following extracts taken? Who are the authors of those poems?

- a. "Stone walls do not a prison make,
Nor iron bars a cage."
- b. "Gentle wishes long subdued,
Subdued and cherish'd long."
- c. "Lo thy dread empire, Chaos! is restored;
Light dies before the uncreating word:
Thy hand, great Anarch! lets the curtain fall,
And universal darkness buries all."
- d. "Our birth is but a sleep and a forgetting."
- e. "Like a poet hidden
In the light of thought,
Singing hymns unbidden,
Till the world is wrought
To sympathy with hopes and fears it heeded not."

5. a. Mr. Collier speaks of the following lines of Marlow as Alexandrines. Is he right in doing so?

- "But, for we know thou art a noble gentleman."
"Thou com'st from Mortimer and his accomplices."
"Yet will I call on him. Oh spare me, Lucifer."

b. What rule of the Alexandrine is violated in the following line of Dryden?

- "And with paternal thunder vindicates his throne."

6. State the rule for the correct use of the phrases,—*"If I am,"* and *"If I be."*

POLITICAL ECONOMY.

MR. M'DOWELL.

1. Explain and illustrate the statement that demand for commodities is not demand for labour.
2. As a cause of variation in value, the quantity of labour is the most important element?
3. High prices from restrictive laws cannot tend to increase wages?
4. Rent does not enter into the cost of production of agricultural produce. What limitations are necessary to render this strictly accurate?
5. To what circumstances does Mill attribute the peculiar force of the effective desire of accumulation in England?
6. When money is the exclusive instrument of exchange, show that the quantity of money wanted will depend partly on the cost of producing gold, and partly on the rapidity of circulation.

HISTORY.

PROFESSOR BARLOW.

1. Draw an outline map showing the boundaries of the empire of Charlemagne.
2. Trace the connexion between the wars of Charlemagne and the invasions of England by the Northmen.
3. Draw up genealogical tables showing the descent of—
 - (a) Louis d'Outremer from Charlemagne;
 - (b) Charles of Anjou from Hugh le Grand;
 - (c) Louis, Duke of Orleans (ob. 1407), from Saint Louis.
4. What territorial additions were made to the French monarchy under Philip le Bel? and by what means?
5. Give an account of the compact known in French history as *le marché diabolique*.
6. Write a short essay on the condition of France after the battle of Poitiers.
7. Give some account of the following persons :—

Valentina Visconti,
Arnaud, abbé de Cîteaux,
Blanche de Castile.
8. Discuss the historic credibility of the story of Harold's visit to Normandy, and his oath to forward William's accession to the English throne.
9. What is Hallam's opinion with respect to the policy of the pacification of Berwick in 1639?
10. What statute is commonly supposed to have given the first legal authority to the criminal jurisdiction of the Star-chamber? Is this correct?
11. What are the articles in the Act of Settlement which were intended to take effect only from the commencement of the new limitation to the House of Hanover?
12. Give a short account of—

The conspiracy of Grandval,
The battle of Almanza,
The trial and death of Major André.

Classics.

ARISTOTLE.

MR. GRAY.

Translate the following passages into English Prose :—

1. *Beginning*, Τὸ δ' ὄνομα τῆς ἀκολασίας καὶ ἐπὶ τὰς παιδικὰς, κ. τ. λ.
Ending, καὶ τῷ λόγῳ μὴθὲν ἐναντιοῦσθαι.
Nichomachean Ethics, lib. III. c. xii. 5-7.
2. *Beginning*, 'Ο δὲ μεγαλοκρεπὴς ἐπιστήμονι ἔοικεν' κ. τ. λ.
Ending, Καὶ ἔστιν ἔργου ἀρετὴ μεγαλοπρέπεια ἐν μεγέθει.
Ibid., lib. IV. c. ii. 5-10.
3. *Beginning*, 'Ἀλλ' ἐν μὲν ταῖς κοινωνίαις ταῖς ἀλλακτικαῖς, κ. τ. λ.
Ending, δεῖ οὖν ταῦτα ἰσασθῆναι.
Ibid., lib. V. c. v. 6-9.
4. *Beginning*, "Ἔστι δὲ καὶ ἡ πολιτικὴ καὶ ἡ φρόνησις, κ. τ. λ.
Ending, τῶν δὲ τὸ τί ἐστὶν οὐκ ἄδηλον.
Ibid., lib. VI. c. viii. 1-6.
5. *Beginning*, 'Ἀλλ' ἐπεὶ διχῶς λέγομεν τὸ ἐπίστασθαι, κ. τ. λ.
Ending, ἄλλως δὲ θανμαστόν.
Ibid., lib. VII. c. iii. 5, 6.

1. Write an account of Aristotle's career, giving the principal dates.
2. Sir Alexander Grant divides the history of moral philosophy in Greece, previous to Aristotle, into three eras; make some remarks on the characteristics of each.
3. Examine the difference between *δύναμις*, *ἔξις*, and *ἐνέργεια*; and discuss the meaning of the latter as applied to the definition of happiness.
4. Mention the special cases in which (α) the subject is not marked by the article, or (β) the article appears with the predicate.

CICERO.

MR. FERRAR.

Translate the following passages into English :—

1. *Beginning*, Experiamur igitur, inquit, etsi habet hæc Stoicorum.....
Ending, Quid enim hoc possumus agere divinius?
De Finibus, lib. iii. c. 4.
2. *Beginning*, Nam ut utilitatem nullam esse docuimus,.....
Ending, condimenti fortasse nonnihil, utilitatis certe nihil habebit.
De Officiis, lib. iii. c. 33.

3. *Beginning*, Græci autem *paviam* unde appellant, ...

Ending, Nos ad propositum revertamur.

Tusc. Disp., lib. iii. c. 5.

4. *Beginning*, Omitto enim vim ipsam omnium, ...

Ending, aliorum amputatio, aliorum immissio.

De Senectute, c. 75.

1. Give a sketch of Cicero's philosophical opinions.
2. How did Augustus try to raise the estimation of the Roman citizenship?
3. What fact shows that the municipal system was more fully developed in Gaul than in the other provinces?
4. What points of resemblance existed between Cicero and the younger Africanus?
5. What is Merivale's estimate of the character of Augustus?
6. What elements of unity existed in the Roman Empire?
7. What traces of the conventional language of symbols still appear in the Roman law?
8. Through what channel did the Aramaic Religion influence Italy?
9. Give an account of the Roman systems of notation.
10. What is Mommsen's view of the political position of the Claudian family in Roman history?
11. What is proved by the grammatical formation of the words, *Agri-gentum*, *Tarentum*, &c.?
12. With what English words are the following connected: *mirus*, *volo*, *sudo*, and *veho*?
13. Analyze the words, *ejus*, *nos*, *tibi*, and *mihi*.
14. How are *somnus* and *sleep* connected together? Mention some parallel cases.

MR. ABBOTT.

Translate the following passage into Greek Verse:—

Beginning, In that fair clime, the lonely herdsman, stretched

Ending, When winds are blowing strong.

WORDSWORTH, *The Excursion*, book iv.

Translate the following passage into Greek Prose:—

Beginning, To those animals, over which we are masters for however short a time, ...

Ending, the only time he has lived to any purpose worth recording.

HELPS, *Essays written in the Intervals of Business*, p. 40.

Translate the following passage into Latin Prose:—

Beginning, The world, therefore, on the whole, ...

Ending, supporting the old freedom of the Forum.

LIDDELL, *History of Rome*, book vii. c. 66.

Translate the following passage into Latin Verse:—

Beginning, Now, all amid the rigours of the year, ...

Ending, Before my wondering eyes.

THOMSON, *Seasons—Winter*, 24-39.

JUNIOR SOPHISTERS.

Mathematical Physics.

DR. SALMON.

1. If bodies be projected from the same point with velocities proportional to the sines of their elevations, find the locus of points arrived at in a given time.

2. Find how the thickness of a string must vary in order that it may hang in the form of a semicircle.

3. Prove from the equations of motion that a particle attracted by a central force, varying as any function of the distance, may describe a circle; and find the requisite velocity of projection.

4. How is the value for the time of vibration of a circular pendulum to be corrected, when the length of the arc is taken into account? Suppose the arc 60° ?

5. What would be the motion of a projectile, if the force of gravity varied inversely as the cube of the height of the body above a horizontal plane?

DR. SHAW.

6. Assuming that the orbit of a body, acted on by a central force, has for its equation

$$c^2 \left(\frac{du^2}{dw^2} + u^2 \right) - 2 \int R \frac{du}{u^2} = k,$$

show (a) that the orbit is a focal conic when the force varies inversely as the square of the distance, and (b) that its axis major and excentricity are determined by the equations

$$\frac{1}{a} = \frac{2}{\rho} - \frac{V^2}{\mu}, \quad e^2 - 1 = \frac{V^2 \rho^2 \sin^2 c \left(V^2 - \frac{2\mu}{\rho} \right)}{\mu^2}.$$

7. Find the total range and the total time of flight of an imperfectly elastic ball, which, projected with a given velocity and in a given direction, ricochets n times along a horizontal plane.

8. Two weights, P and W , suspended on a wheel and axle, do not make equilibrium; find the accelerating force on each weight, and the tension on each rope, the moment of inertia of the machine being Mk^2 .

9. A uniform segment of a circle rests with one point of its circumference on a horizontal plane, and with another against a vertical plane; the coefficients of friction being μ , μ' , find the pressures on the two planes, and the position bordering on motion.

10. In a semicircle let the density vary inversely as the distance from centre; find the centre of gravity.

MR. WILLIAMSON.

11. Calculate the pressure which, uniformly applied for one minute, will generate a velocity of 30 miles an hour, in a train of 40 tons weight, moving on a horizontal railway; assuming the friction 8 lb. per ton, and neglecting the resistance of the air.

12. A rectangular beam rests on a rough horizontal plane, and a rope is attached to it at a given height; find the magnitude and direction of the strain which should be applied to the rope in order that the beam may commence to tumble and slide simultaneously.

13. A particle is attracted by one centre of force, and repelled by another; if the law of force be directly as the distance, and the absolute intensities equal, find the path described.

14. A rectangular board is supported in a vertical plane by a string which passes over a smooth nail, and is attached to two points symmetrically situated in one edge; find the positions of equilibrium, and determine whether they are stable or unstable.

15. Two bodies are projected together from the same point with equal velocities, but in different directions; prove that the line which connects their positions at each instant moves parallel to a given line.

DR. SALMON.

1. Prove the law for the composition of two couples not in the same plane. Show that a system of forces can be reduced to a couple and a force perpendicular to their plane.

2. Find the centre of gravity of the arc, and of the area, of a semicircle.

3. Find the strain on the string in a circular pendulum.

4. If the length of the seconds pendulum were 39 inches, what would be the corresponding value of g ?

5. Find the range of a projectile on an oblique plane, and also the time of flight.

6. Determine the motion of a body placed anywhere on the line joining two centres of force attracting directly as the distance.

DR. SHAW.

7. A railway carriage weighing 7 tons, and moving at 30 miles an hour, describes a portion of a circle whose radius is 1380 ft. Calculate its centrifugal force in tons.

8. A goods train weighing 200 tons, and travelling at 20 miles an hour, runs into a passenger train of 50 tons standing on the same line. Find the rate at which the remains of the passenger train will be propelled along the line, supposing coefficient of elasticity = $\frac{1}{2}$.

9. On the middle point of the upper surface of a homogeneous cube whose side = l , rests a sphere also homogeneous, the specific gravity of which is to that of the cube as 3 : 47. Find the comparative magnitudes of the sphere and cube, so that the centre of gravity of the system may be distant from that of the sphere by a length = $\frac{l}{3}$.

10. A weight P , after falling freely through h feet, begins to pull up a heavier body Q , by means of a cord which connects them, and plays without friction over a pulley. Find the height through which Q will ascend.

11. Two heavy rods are connected by a smooth hinge. Their other ends are also respectively connected with smooth hinges to a vertical staff. Find the magnitude and directions of the pressures on the hinges, and of the mutual action of the rods at the joint.

12. From the centre of gravity of a cube placed on a rough inclined plane, draw the right line which represents in magnitude and direction the force which will just suffice to move the body up the plane, while increasing the body's pressure on the plane in the ratio of 1 : m .

MR. WILLIAMSON.

13. Find the position of equilibrium of a beam in a hemispherical bowl, when part of the beam projects beyond the rim.

14. The interval between the threads of a screw is $\frac{1}{8}$ th of an inch, the diameter is 3 inches, and the radius of the circle described by the power 2 feet; find what power will be required to overcome a resistance of 1000 lbs.:—(1.) Neglecting friction; (2.) Allowing for the friction along the thread of the screw. The coefficient of friction being 0.15.

15. A ball of 56 lbs. weight, after traversing 4 ft. of the bore of a cannon, leaves it with a velocity of 1000 ft. per second; what mean pressure (over and above friction and the resistance of the air) must have been exerted on it to produce this velocity?

16. Two perfectly elastic spheres meet directly with equal velocities; find the relation between their masses, in order that one of them may be reduced to rest by the collision.

17. A body describes an orbit round a centre of force attracting directly as the distance; find the time of revolution, and the equation of the orbit.

18. A uniform rod rests within a rough vertical circle; investigate its limiting positions of equilibrium.

Experimental Physics.

THEORY OF HEAT.

MR. GALBRAITH.

1. A barometer tube contains 6 inches of air over the mercurial column, if the tube is plunged 10 inches deeper into the trough the air will occupy only 4 inches; find the height of the column before and after depression, supposing the atmospheric pressure to be 30 inches, and the temperature constant.

2. Suppose the temperature to change from 74° F. to 32° F., what will these heights be?

3. If a mass of dry air be taken which weighs 10.95 grains, prove that its volume in cubic inches, multiplied by its pressure in pounds per square inch, is the exact measure of its absolute temperature.

4. Prove the following expression for the weight in grains of a given volume of gas in cubic inches, the pressure and temperature being expressed in inches of mercury, and degrees Fahrenheit,

$$W = \frac{5.375 Vps}{460 + t}.$$

5. Prove the following expression for the weight in grammes, the volume being in litres, the pressure in millimetres, and the temperature in centigrade degrees

$$W = \frac{0.4645 Vps}{273 + t}.$$

6. If 30 oz. of mercury held in a glass flask, the weight of which is 5 oz., is able to melt 2 oz. of ice in Lavoisier's calorimeter in descending from a temperature of 174° F. Calculate the specific heat of mercury.

7. Let 500 grs. of steam, having a temperature of 214° F., be condensed in a pound of water, having a temperature of 60° F.; if the temperature of the water be raised to 129° F., calculate the latent heat of steam. The pound of water is contained in a glass flask, the weight of which is 2500 grains.

8. Deduce the expression for the volume of steam as compared with that of the water which has yielded it in terms of its pressure in pounds per square inch, and its temperature.

9. What empirical formula will give this volume in terms of the pressure alone?

10. Prove the following formula for the height of a mountain as determined by the barometer.

$$H \text{ (in fathoms)} = 10000 \log \frac{h}{h'}.$$

MECHANICS.

DR. HAUGHTON.

1. A handle, with an arm 2 ft. long, turns an endless screw, which works a wheel with 60 teeth; and a chain, supporting a weight of 5 tons, is coiled up on the shaft of this wheel, the shaft being 6 inches in diameter. What force must be applied to the handle to balance this weight?
2. Find the centre of gravity of a trapezoid, whose parallel faces are a and b , and their mutual distance is h .
3. The velocities acquired in running down all inclined planes of the same height are equal; how is this property modified by friction?
4. Find the quickest line of descent between two circles in the same plane.
5. Find the motion of two spheres of equal size and perfect elasticity, after oblique impact.

History and English Literature.

HISTORY.

PROFESSOR BARLOW.

1. What causes are assigned by Hallam for the great difference which existed between the French and English systems of feudal policy?
 2. Write out as many of the clauses of Magna Charta as you can remember, and comment shortly on any expressions which appear to require elucidation.
 3. Richard, Duke of Gloucester, has been charged with the murders of Edward, Prince of Wales, and of his father, King Henry VI. Consider the justice of each of these imputations.
 4. What is Sir Francis Palgrave's theory as to the origin of Borough Representation? For what reason is it rejected by Hallam?
 5. Relate the history of trial by jury in England during the Anglo-Saxon period.
 6. Write a short historical essay on the reign of Edgar the Peaceable.
 7. "With respect to those who were indebted for their seats among the lords to the king's writ, there are two material questions: whether they acquired an hereditary nobility by virtue of the writ; and, if this be determined against them, whether they had a decisive or merely a deliberative voice in the house."
- Discuss both of these questions.
8. Give some account of—

The Witan of Canne,
 William Fitz-Osbert,
 The *coup-d'état* of 1397.

ENGLISH LITERATURE.

PROFESSOR INGRAM.

1. Examine the question—Whether, and how far, there is a Scandinavian element in the English language?

2. What is Mr. Guest's explanation of the way in which the transformation of Anglo-Saxon into English was brought about? How is this view criticised by Mr. Craik?

3. Give a complete account of the several ways in which the *final*, characteristic of Chaucer's English, seems to have originated.

4. Render the following passages of Chaucer into modern English, and comment fully on any remarkable words or forms which occur in them:—

a. "With him ther was his sone, a yonge squier,
A lover, and a lusty bachelor,
With lockes crull as they were laide in presse;
Of twenty yere of age he was I gesse.
Of his stature he was of even lengthe,
And wonderly deliver, and grete of strength.
And he hadde be sometime in chevauchie,
In Flanders, in Artois, and in Picardie,
And borne him wel, as of so litel space,
In hope to stonden in his ladies grace.
Embrouded was he, as it were a mede,
Alle full of freshe floures, white and rede.
Singing he was or floyting alle the day:
He was as freshe as is the moneth of May.
Short was his gowne, with sleeves long and wide;
Wel coude he sitte on hors and fayre ride.
He coude songes make, and wel endite,
Juste and eke dance, and wel pourtraie and write.
So hote he loved that by nightertale
He slep no more than doth the nightingale."

b. "But of his craft, fro Berwike unto Ware,
Ne was ther swiche another pardonere.
For in his male he hadde a pilwebere,
Which, as he saide, was oure ladies veil:
He saide, he hadde a gobbet of the seyle
Thatte seint Peter had, whan that he went
Upon the see, till Jesu Christ him hent,
He had a crois of laton ful of stones,
And in a glas he hadde pigges bones.
But with these reliques, whanne that he fond
A poure person dwelling up on lond,
Upon a day he got him more moneie,
Than that the person gat in monethes tweie.
And thus, with fained flattering and japes,
He made the person, and the peple, his apes."

5. Explain the following words, which occur in Chaucer's Prologue: alderbest, covine, goliardaia, halwes, lodemanage, mistere, sausefleme, wastel, winning.

d

6. Write grammatical notes on the following phrases :—
- "If the salt have lost his savour . . ."
 - "He asked an alms."
 - "In one hour so great riches is come to nought."
 - "....Doth not behave itself unseemly."
 - "Whom say ye that I am?"
7. Trace the following words to their origin in the Latin language : ally, charm, engine, lieutenant, pay, sir, spend, trespass.
8. Coleridge says : "In order to get the full sense of a word, we should first present to our minds the visual image that forms its primary meaning." Treat in this manner the following words: attention, caprice, desultory, hypocrite, integrity, reprehend, succour.

Classics.

EURIPIDES.

MR. FERRAR.

Translate the following passages into English :—

- Beginning*, χοροὶ χοροὶ καὶ θαλαῖαι μέλουσι Θήβας ἱερὸν κατ' ἄστυ,
κ. τ. λ.
Ending, νόμον παρέμενος, ἀνομίᾳ χάριν διδούς.
Hercules Furens, 763-779.
- Beginning*, οὐ προκαλυπτομένα βοτρυνώδεος, κ. τ. λ.
Ending, ἄχεσι συνψῶς;
Phœnissæ, 1485-1517.
- Beginning*, ἐπεὶ πρὸς ἀκτὰς ἤλθομεν θαλασσίας, κ. τ. λ.
Ending, ἐλευθέρους πρύμνηθεν ἐστῶτας νεώς.
Iphigenia in Tauris, 1327-1349.
- Beginning*, εὐρείας φάρυγγος, ὧ Κύκλωψ, κ. τ. λ.
Ending, ἀνθρώπων θέρμ' ἀπ' ἀνθρώκων κρέα.
Cyclops, 356-374.
- Beginning*, νέος μὲν οὖν ὦν ἀμφὶ βωμίους τροφὰς, κ. τ. λ.
Ending, κρυπτοὶ γένωνται παῖς τ' ἔχῃ τὰ πρόσφορα.
Ion, 52-74.

- Write a note on the mythology of the Iphigenia in Tauris.
- Give a sketch of the Plot of the Hercules Furens.
- Quote some passages from the plays of Euripides, showing his partiality for the philosophy of Anaxagoras.

4. According to Paley, two faults may fairly be attributed to Euripides?
5. What reason does Paley assign for the enmity shown towards him by Aristophanes?
6. Compare ancient and modern Tragedy.
7. The worship of Bacchus was twofold?

MR. GRAY.

Translate the following passages into English Prose :—

1. *Beginning, Mes.* In scirpo nodum quæris. Quin nos hinc domum . . .
Ending, Ubi nil habebis, geminum dum quæris, gemes.
 PLAUTUS, *Menæchmi*, act II. sc. i. 22-32.
2. *Beginning, Mes.* Sciti'n' quid ego vos rogo?
Ending, Vix (credo) tota auctione capiet quinquagesies.
 PLAUTUS, *Menæchmi*, act V. sc. ix. 92-99.
3. *Beginning, Con.* Cense'n' talentum magnum exorari potesse
Ending, Solet ire coctum.
 PLAUTUS, *Aulularia*, act II. sc. iv. 30-46.
4. *Beginning, Nunc* illud est, quom me fuisse, quam esse, nimio mavelim :
Ending, Nugas ineptiasque incipisso. Hæreo.
 PLAUTUS, *Capteivei*, act III. sc. iii.
5. *Beginning, G.* Nullus 's, Geta, nisi aliquod jam consilium celere repereris :
Ending, Convasavissem, atque dehinc me protinam conjicerem in pedes.
 TERENCE, *Phormio*, act II. sc. ii. 1-13.
6. *Beginning, Gn.* Di immortales, homini homo quid præstat? stulto intellegens
Ending, Vocabula, parasiti item ut Gnathonici vocentur.
 TERENCE, *Eunuchus*, act II. sc. ii. 1-33.

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1. Write brief notes on the above passages wherever you think them necessary.
 2. Give the derivation and meaning of the following: *cerritus, intercus, glaber, cinisfo, bazea, confuto, protelo, scapulae*.
 3. Give the rules for Latin accentuation.
 4. Rome, in the time of Terence, seems to have been divided into two literary factions?
 5. Give an account of the life and literary position of Livius Andronicus.
 6. Give an account of the life and writings of the three oldest Roman comic writers of note.
 7. Explain fully the distinction between *fabula prætextata*, *fabula palliata*, and *fabula togata*.

MR. ABBOTT.

Translate the following passage into Greek Verse:—

Beginning, Then am I doubly hopeless. What is gone, ...

Ending, Is such my doom? Nay, speak it, if it be.

TAYLOR, *Philip Van Artevelde*, act III. sc. ii.

Translate the following passage into Greek Prose:—

Beginning, Paternal authority, and the order of domestic life, ...

Ending, be entirely or abruptly withdrawn.

PALEY, *Moral Philosophy*, book vi. c. 7.

Translate the following passage into Latin Hexameters:—

Beginning, He look'd, and saw wide territory spread

Ending, On each hand slaughter, and gigantic deeds.

MILTON, *Paradise Lost*, book xi.

Translate the following passage into Latin Prose:—

Beginning, Envy and cavil are the natural fruits of laziness and ignorance, ...

Ending, who not only knows, but scrupulously observes them.

SPECTATOR, No. 592.

SENIOR FRESHMEN.

Mathematics.

DR. SALMON.

1. Prove that in a plane triangle

$$(\cos \frac{1}{2}A + \cos \frac{1}{2}B + \cos \frac{1}{2}C) (\cos \frac{1}{2}B + \cos \frac{1}{2}C - \cos \frac{1}{2}A) (\cos \frac{1}{2}C + \cos \frac{1}{2}A - \cos \frac{1}{2}B) (\cos \frac{1}{2}A + \cos \frac{1}{2}B - \cos \frac{1}{2}C) = 4 \cos^2 \frac{1}{2}A \cos^2 \frac{1}{2}B \cos^2 \frac{1}{2}C.$$

2. Transform the equation

$$\alpha^2 \cos^2 \frac{1}{2}A + \beta^2 \cos^2 \frac{1}{2}B + \gamma^2 \cos^2 \frac{1}{2}C - 2\alpha\beta \cos^2 \frac{1}{2}A \cos^2 \frac{1}{2}B - 2\beta\gamma \cos^2 \frac{1}{2}B \cos^2 \frac{1}{2}C - 2\gamma\alpha \cos^2 \frac{1}{2}C \cos^2 \frac{1}{2}A = 0$$

into the form

$$(l\alpha + m\beta + n\gamma) (\alpha \sin A + \beta \sin B + \gamma \sin C) = p (\beta\gamma \sin A + \gamma\alpha \sin B + \alpha\beta \sin C),$$

and determine the values of l, m, n, p .

3. Find in trilinear co-ordinates the equation of the circle passing through the middle points of the sides.

4. Find the equations of the common tangents to the circles

$$(x-3)^2 + (y-4)^2 = 25, \quad x^2 + y^2 = 9.$$

5. Find the equation of the locus of the vertex of a triangle whose sides pass respectively through points $x'y'$, $x''y''$, and which makes on the axis of x a given intercept a .

6. Find the sum of the series

$$1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$$

DR. SHAW.

7. Divide an arranged algebraical equation by its first term x^n , and take the log of the quotient $1 + P$ by the formula,

$$\log(1 + P) = P - \frac{1}{2}P^2 + \frac{1}{3}P^3 - \dots$$

Show that the coefficient of x^m in this series, when multiplied by $-m$, is the sum of the m^{th} powers of the roots of the given equation; and apply this principle to find the sum of the fifth powers of the roots of the equation $x^3 - 5x + 6 = 0$.

8. Show that the product of the determinants

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} \quad \text{and} \quad \begin{vmatrix} a_1 & \beta_1 & \gamma_1 \\ a_2 & \beta_2 & \gamma_2 \\ a_3 & \beta_3 & \gamma_3 \end{vmatrix}$$

is itself a determinant.

9. A series of circles touch the same right line at a fixed point, and are cut by a fixed circle; take the common tangent and the perpendicular to it as your axes of co-ordinates, and express the locus of the point which is with respect to the fixed circle the pole of the varying chord of intersection.

10. A variable circle cuts two fixed circles at constant angles; show, both by analytic and plane geometry, that it will also touch two fixed circles.

11. In an oblique-angled spherical triangle, if one side (c) vary, show that the corresponding variation in the adjacent angle A is

$$\Delta A = \Delta c \cdot (\cot A \cot c - \cot b \operatorname{cosec} A).$$

12. If $t = n\theta - \frac{2e}{m}(1-n)\sin m\theta$ and the coefficient $\frac{2e(1-n)}{m}$ be very small, show that, *quam proxime*,

$$\sin t = \sin n\theta - \frac{e}{m}(1-n) \{ \sin(n+m)\theta - \sin(n-m)\theta \}$$

and

$$\cos t = \cos n\theta + \frac{e}{m}(1-n) \{ \cos(n-m)\theta - \cos(n+m)\theta \}.$$

MR. WILLIAMSON.

13. A right line touches two fixed circles in points T and T' ; from a fixed point O on it any secant is drawn cutting the first circle in points A, B , and the second in A', B' . Find the locus of the intersection of lines TA and $T'A'$; and determine in what case the locus becomes a right line.

14. Prove that the roots of the cubic

$$(x-a)(x-b)(x-c) - a'^2(x-a) - b'^2(x-b) - c'^2(x-c) - 2a'b'c' = 0$$

are all real, and investigate the conditions that it should have equal roots.

15. The construction of a quadrilateral of maximum area, being given three of its sides, is reducible to the solution of a cubic equation; find the cubic, and prove that its roots are all real.

16. Taking two sides of a triangle inscribed in a circle for axes of co-ordinates; express the co-ordinates of the centre in terms of the lengths of these sides, and apply them to find the equation of the locus of centre of circumscribing circle, when two of the sides are fixed in position, and the third passes through a given point.

17. In a spherical triangle, if

$$\sin \frac{2c}{2} = \sin \frac{2a}{2} + \sin \frac{2b}{2},$$

prove that $C = A + B$.

18. Find the sum of n terms of the series

$$\cos a + \cos (a+d) + \cos (a+2d) + \&c.$$

DR. SALMON.

1. Find the co-ordinates of the intersection of the perpendiculars of the triangle $(2, 4), (3, 5), (6, 1)$.

2. Find the equation of the circle circumscribing the triangle, $(0, 3), (4, 0), (1, 1)$.

3. Find the locus of vertex of a triangle, being given the base, and $\cot A + 2 \cot B$.

4. Find the condition that the following cubic may have a pair of equal roots:

$$ax^3 + 3bx^2 + 3cx + d = 0.$$

5. If A, B, C be angles of a plane triangle, prove

$$\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C,$$

$$\sin A + \sin B + \sin C = 4 \cos \frac{1}{2}A \cos \frac{1}{2}B \cos \frac{1}{2}C.$$

6. Express the area of a spherical triangle, being given two sides and the included angle.

DR. SHAW.

7. From the equations of two circles show that every secant drawn through the intersection of common tangents is cut similarly by the circles.

8. Form the equation of the circle exscribed to the base of the triangle

$$\alpha = 0, \beta = 0, \gamma = 0.$$

9. Given the three angles of a spherical triangle, deduce the expressions for the sine and cosine of half one of the sides.

10. In a right-angled spherical triangle, where C is the right angle, and A is invariable, find the change on the hypotenuse c consequent on a small change in the side b .

11. Resolve into partial fractions the expression

$$\frac{11x^2 - 26x + 107}{x^3 - x^2 - 21x + 45},$$

the denominator of which has two equal roots.

12. Calculate to three places of decimals the root lying between 5 and 6 of

$$x^3 - 2x^2 - 23x - 70 = 0.$$

MR. WILLIAMSON.

13. Prove that the sum of the radii of the circles inscribed in a spherical triangle and circumscribing its polar is equal to a quadrantal arc.

14. One angle of a triangle is fixed in position, and the sum of m times one adjacent side and n times the other is given; find analytically the locus of the centre of the circumscribing circle.

15. Find the equation of the line which passes through the intersection of the lines,

$$\left. \begin{array}{l} 2x + 3y = 7 \\ x + 2y = 8 \end{array} \right\} \text{ and of } \left. \begin{array}{l} x - y = 4 \\ 3x + 2y = 34 \end{array} \right\}.$$

16. If $a + b + c = 0$, prove that

$$(a^2 + b^2 + c^2)^2 = 2(a^4 + b^4 + c^4).$$

17. The lines OC and OC' are divided in the same anharmonic ratio in the points, O, A, B, C and O, A', B', C' ; prove by analysis that the lines AA' , BB' , and CC' pass through the same point.

18. Transform a cubic whose roots are α, β, γ into another whose roots are

$$\alpha^2 + \beta^2 - \gamma^2, \beta^2 + \gamma^2 - \alpha^2, \text{ and } \alpha^2 + \gamma^2 - \beta^2.$$

Logics.

MR. POOLE.

1. What circumstances give rise to the belief that there are different *kinds of reasoning*?—and how does Archbishop Whately answer this opinion in the two forms in which it appears?

2. What remarks does he make on the observation, “that it is difficult to prove a negative”?

3. In a *conditional* proposition *two* false modes of reasoning may be adopted; what are these? To what fallacies in *categorical syllogisms* do they correspond?—and give examples.

4. How are *nominal* and *real* definitions related to each other? When do they agree?—when differ?

5. How does Archbishop Whately explain the “fallacia figuræ dictionis”? He divides it into two cases? Give examples of these; and state why this fallacy is so frequently employed.

6. What important instances does he give of the fallacy of “composition”?—and state the reasoning in each.

7. When it is denied that new truths are brought to light by a process of reasoning, with what restrictions is this statement true?

8. According to Archbishop Whately, Plato reduces all Knowledge to a resemblance to Mathematical—how? and show how this accounts for one of Plato's doctrines.

9. Explain the mode of reasoning by Induction, and state the different circumstances which give strength to it in any case where it is applied.

DR. MALET.

1. No legitimate syllogism could violate both the rules of the first figure? (This is *not* to be proved by the Special Rules.)

2. Prove, from the Special Rules of the first figure, that it can have four distinct conclusions, and not more than four.

3. Is *Reductio ad Impossibile* applicable to *all* legitimate modes?—if so, how would you use it, respectively, in the second, third, and fourth figures?

4. In this kind of Reduction, if you substitute for a premiss the contrary or subcontrary of the conclusion, show that in each case, respectively, you draw a conclusion the contrary or subcontrary of the omitted premiss.

5. Is the Reduction valid in either case?

6. What two modes would satisfy the rules of all the figures? How is it, then, that there is only one mode common to all?

7. Prove, *without the special rules*, that EIO is common to all.

8. One mode would violate five general rules; find it by tracing the effect of violating each rule, beginning at the first.

9. In substituting the conclusion for a premiss, in order that the new premises should be legitimate, how is the *excluded* premiss limited?

10. Prove, by applying the three relative affections only, that if E or I be false, its converse E or I will be false.

DR. DICKSON.

1. Explain and exemplify the ambiguity of the term “Experience.”

2. What advantages arise from fixing the meanings of terms? By what process is this to be effected? Illustrate your meaning in the case of the word “Old.”

3. Give the logical rules laid down by Whately, and the order in which they ought to be applied, so as to test the validity of apparent syllogisms.

4. Exhibit the following argument in a syllogistic form, and name the mode and figure :—

“No sentence is triter than that example is more powerful than precept ; but when the example is set by the rich and great, its influence on the herd of mankind becomes irresistible.”

5. Reduction *ad impossibile* having been employed, if the reduct conclusion be O, determine the reducend mode (*a*) when the minor is suppressed, and (*b*) when the major.

6. State and prove the rules of the Sorites.

7. Compare the classification of sophisms made by Murray and by Whately.

Classics.

PLATO.

MR. GRAY.

Translate the following passages into English Prose :—

1. *Beginning*, Πῶς, ὦ Σώκρατες; 'Εγὼ ἔρῳ, ἔφη. γιγνώσκουσι γάρ, κ. τ. λ.
Ending, ὃ δὲ αὐτὴ ὁρᾷ νοητόν τε καὶ αἰδέεσθαι.

Phædo, xxxiii.

2. *Beginning*, Ὁ παῖ 'Ιππονίκου, αἰεὶ μὲν ἔγωγέ σου τήν, κ. τ. λ.
Ending, διαλεγομένους καὶ τὸ δημηγορεῖν.

Protagoras, xxii.

3. *Beginning*, Διὰ ταῦτα οὐ νόμος ἐστὶ σεμνύνεσθαι τὸν, κ. τ. λ.
Ending, σὺν τοῖς φιλτάτοις ἢ αἵρεσις ἡμῖν ἐσται ταύτης τῆς δυνάμεως τῆς ἐν τῇ πόλει.

Gorgias, lxviii.

4. *Beginning*, MEN. Ὁ Σώκρατες, ἤκουον μὲν ἔγωγε πρὶν καὶ, κ. τ. λ.
Ending, τάχ' ἂν ὡς γόης ἀπαχθείης.

Meno, xiii.

1. In the third passage, explain how καίπερ means “although.” What is the exact Latin equivalent for it?

Explain also μὴ ὅτι before κυβερνήτου, and give the Latin for it.

2. What is the meaning of οὐχ ὅπως when followed in the next clause by ἀλλὰ or ἀλλὰ καὶ?

3. Translate the following sentences :—

ἐπεὶ Σωκράτη γε ἐγὼ ἐγγυῶμαι μὴ ἐπιλήσεσθαι, οὐχ ὅτι παίζει καὶ φησιν ἐπιλήσμων εἶναι.—*Protag.*

εἰ τις ἔροίτο ἡμᾶς, τῶν τί σοφῶν εἰσιν οἱ ζωγράφοι ἐπιστήμονες . . .
ὁ δὲ σοφιστὴς τῶν τί σοφῶν ἐστίν.—*Protag.*

ᾧ ἂν τί σώματι ἐγγένηται θερμὸν ἔσται.—*Phæd.*

οὐκοῦν ἀνάγκη γ', ἂν πολὺ ἐπιβρέη, πολὺ καὶ τὸ ἀπὸν εἶναι καὶ
μεγάλ' ἅττα τὰ τρηματα ταῖς ἐκροαῖς.—*Gorg.*

δυνάμενον πληροῦντα χαίροντα εὐδαιμόνως ζῆν.—*Gorg.*

4. Arrange the Greek prepositions according to the cases they govern; and point out the difference between *ἀντί* and *πρό*, *ἀπό* and *ἐξ*, *ἀμφί* and *περί* *διά* with the genitive and with the accusative, *κατά* with the genitive and with the accusative.

5. Grote says, "the appearance of the Sophists (during the last half of the fifth century B. C.), was no new fact." Develop this statement. How does he explain the hostility of Plato against them?

6. Grote points out the three leading peculiarities of Socrates; discuss each at some length.

CICERO.

MR. ABBOTT.

Translate the following passages into English:—

1. *Beginning*, Num igitur dubitamus, sicut pleraque, sic et hoc?
Ending, sive quod a gravioribus leviora natura repellantur.
Tusc. Disp., lib. i. c. 18.
2. *Beginning*, Sed in animo tantummodo cogitatione possumus
Ending, dum est insipiens, sed non distorta nec prava.
Tusc. Disp., lib. iv. c. 13.
3. *Beginning*, Populares isti jam etiam modestos homines
Ending, millies coactus est dicere.
Epist. ad Att., lib. ii. e. 19.
4. *Beginning*, Quid ergo dubitamus, quin, si non dolere voluptas
Ending, quum dolore careamus.
De Fin., lib. ii. c. 9, 10.
5. *Beginning*, Itaque aut tutela cogito me abdicare, aut, ...
Ending, At Scaptius quaternas postulabat.
Epist. ad Att., lib. vi. e. 1.

1. Enumerate the philosophical works of Cicero, mentioning the subject treated of in each, and the condition in which it has come down to us.

2. State the subject of each book of the Tusculan Disputations, and the mode of treatment adopted by Cicero.

3. State briefly, and in order, the principal arguments developed in the first book.

4. How does Cicero render into Latin the words *επιχαιρεκακία*, *θυμός*, *φθόνος*, *επιθυμία*?

5. What distinction does he draw between *lætitiā*, *gaudium*; *libido*, *voluptas*? What are the species of *Ira*?

6. Write historical notes on—

Turbatur Sampsiceramus, . . . *ὁμολογουμένως τυραννίδα συσκευάζεται*.
Quid enim ista repentina affinitatis conjunctio, quid ager Campanus, quid effusio pecuniæ significant.

L. Cæsar mandata Cæsaris detulit ad Pompeium. . . . Probata conditio est, sed ita ut ille de iis oppidis, quæ extra suam provinciam occupavisset, præsidia deducerit.

7. Describe the manner of instituting and carrying on a *Judicium Publicum*, and a *Judicium Populi*.

8. In what manner were the *Judices* appointed at different times?

9. What is meant by a *family* of languages, and how is the relation established?

10. Why is it incorrect to say that Latin is derived from Greek, or either from Sanscrit?

11. In comparing Latin or Greek roots with English (Anglo-Saxon), what differences of form are to be expected?

MR. FERRAR.

Translate the following passage into Greek Iambics:—

Beginning, It pleas'd your Majesty to turn your looks

Ending, To this we swear our aid.

SHAKESPEARE, *King Henry IV.*, act v. sc. 1.

Translate the following passage into Greek Prose:—

Beginning, Some in their discourse desire rather commendation of wit, . . .

Ending, and, as we say now, to jade anything too far.

BACON, *Essay xxxii.*

Translate the following passage into Latin Prose:—

Beginning, Sir, if such a man fell into errors, ...

Ending, more important than the forms in which it is conducted.

BURKE, *On American Taxation.*

Translate the following passage into Latin Hexameters:—

Beginning, If thou beest he; but O, how fallen! how changed

Ending, And shook his throne.

MILTON, *Paradise Lost*, book i.

JUNIOR FRESHMEN.

 Mathematics.

A.

MR. TOWNSEND.

1. Given of two lines their sum or difference, and the sum or difference of their squares; construct them.
2. Given of two lines their sum or difference, and the sum or difference of their reciprocals; construct them.
3. Prove the value for the area of a triangle in terms of the three sides.
4. Prove the value for the radius of the circle circumscribing a triangle in terms of the three sides.
5. Determine the locus of a variable point the sum of whose distances from any number of fixed lines is constant.
6. Determine the envelope of a variable line the sum of whose distances from any number of fixed points is constant.

DR. SHAW.

7. Prove Prop. 24, Book I., and state the reason of the construction given by Euclid.
8. Prove that in equal circles equal angles stand on equal arcs.
9. What is Euclid's definition of equality of ratios?—and show how it is employed in proving Prop. 1, Book VI.
10. Cut a given line, so that the square of one part equals the rectangle under the remainder and another given line.
11. Given base, rectangle under sides, and vertical angle; construct the triangle.
12. If from either point of intersection of two circles, two right lines be drawn cutting the circles in four points, prove the lines joining these points diagonally cut at a constant angle.

MR. WILLIAMSON.

13. Through the middle point of the base AB of a triangle a right line is drawn intersecting the sides BC and AC in the points L and M , respectively; from the vertex draw a line parallel to LM to meet the base, produced if necessary, in E . Prove that the triangles AME and BEL are equal.
14. Construct an equilateral triangle which shall be equal to a given rectilinear figure.

15. Describe a circle which shall pass through a given point, and bisect the circumferences of two given circles.

16. Define ratio, and show how any number of ratios can be compounded into a single ratio.

17. Find a point in a given line, such that the sum of its distances from two given points shall be equal to a given line.

18. State Euclid's twelfth axiom, Book I., and the use which he makes of it. Show that the following would equally have suited his purpose, viz. :—Through a given point there cannot be drawn more than one right line, which shall be parallel to a given line.

B.

MR. TOWNSEND.

1. The three sides of a triangle are 23.4, 25.2, and 27; calculate the radius of its circumscribing circle.

2. The three perpendiculars of a triangle are 18.2, 19.5, and 21; calculate its area.

3. The radii of two circles are 84.5 and 97.5, and the distance between their centres is 91; calculate the length of their common chord.

4. The radii of three circles which touch two and two are 13.5, 15.75, and 18; calculate the radius of their common orthogonal circle.

DR. SHAW.

5. A merchant commenced trade with £3000; he settles his accounts half-yearly, and finds he clears 3 per cent. each half year on the entire stock in trade. What is he worth at the end of $3\frac{1}{2}$ years?

6. A fast train leaves Bristol for London (120 miles distant) at 2 P. M., and travels at 25 miles an hour. At what time must a luggage train, which travels at the rate of 15 miles in 50 minutes, have left, so as to escape being overtaken by the fast train?

7. What ready money will discharge a debt of £528 9s. due 4 months hence, at $4\frac{7}{8}$ per cent.?

8. A and B can do a piece of work separately in 12 and 16 days, respectively; they work together at it for 3 days, when A leaves it, but B continues, and after 2 days is joined by C, and they finish it together in 3 days. In what time would C do it alone?

MR. WILLIAMSON.

9. Find accurately to four decimal places the value of the fraction

$$\frac{97.6237}{0.031}.$$

10. One hundred weight of flour yields 36 quartern loaves: calculate the price of the 2 lb. loaf, the price of flour being 52s. 6d. per sack of $2\frac{1}{4}$ cwt., 5s. per sack being the expense of manufacture, and 10 per cent. being allowed for profit.

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11. The sides of a triangle are 4, 5, 6 : calculate to three places of decimals the distance between the centres of its inscribed and circumscribing circles.

12. The bisectors of the sides of a triangle are 2, 3, 4 ; calculate the sides to four decimal places.

C.

MR. TOWNSEND.

1. Draw the shortest chord of a given angle that can be cut in a given ratio by a given line.

2. Find the point on a given line from which, if perpendiculars be let fall on three other given lines, the area of the triangle determined by their feet shall be the minimum.

3. In a given circle inscribe a triangle two of whose sides shall touch a second given circle, and the third pass through a given point.

4. Given of two circles a pair of common tangents, and a common orthogonal circle ; construct them.

DR. SHAW.

5. Find a point in the diameter of a semicircle such that drawing a secant from it, and letting fall on the diameter perpendiculars from the two points of intersection ; the ratio of these perpendiculars may be given, and also the length they intercept on the diameter.

6. Divide a triangle by a right line from vertex to base, so that the circles inscribed in the two triangles thus formed may be equal.

7. Each of the internal diagonals of a quadrilateral divides it into two triangles ; take the intersection of the bisectors of the sides of each of the four triangles thus formed. Show that the quadrilateral made by joining these four points is similar to the given one, and equal to the ninth part of its area.

8. If two chords of a circle be parallel, any circle which passes through the points in which the lines joining their extremities directly and transversely intersect, cuts the given circle orthogonally.

MR. WILLIAMSON.

9. Prove that the rectangle under the diagonals of a quadrilateral can never be greater than the sum of the rectangles under the opposite sides. In what case is it equal to the sum ?

10. A and B are given points on a diameter of a circle ; through B draw a chord such that the triangle with its vertex at A , and chord for base, shall be equal to a given area. Find the limit to the magnitude of the area, and discuss the two cases which may occur.

11. The hypotenuse of a right-angled triangle is given ; find the locus of the middle point of the line joining the vertices of equilateral triangles described on the sides.

12. The sides of a triangle of given species pass through three fixed points ; find the locus of the intersection of its perpendiculars.

Classics.

DEMOSTHENES.

MR. FERRAR.

Translate the following passages into English Prose :—

1. *Beginning*, ὅτι μὲν δὴ λιποταξίου γραφὴν κατεσκεύασε κατ' ἑμοῦ,
κ. τ. λ.
Ending, οὐδεμιᾶς ἔγωγ' ἔτι, προσδίδομαι δίκης, ἀλλ' ἱκανὴν ἔχω.
Contra Meidiam, 547, 548.
2. *Beginning*, Τοῦτο μέντοι τὸ τοιοῦτον ἔθος καὶ τὸ κατασκευάσμα,
κ. τ. λ.
Ending, οἱ βδελυροὶ καὶ χρήματ' ἔχοντές [εἰσιν ἐγγυτάτω].
Contra Meidiam, 555.
3. *Beginning*, Φέρε δὴ καὶ ὅσους αὐτὸς ἔλυσάμην τῶν αἰχμαλώτων,
κ. τ. λ.
Ending, λέγε ταύτας τὰς μαρτυρίας.
De Falsa Legatione, 394.
4. *Beginning*, Καίτοι σκέψασθε ὅπως ἐπὶ τῶν προγόνων ταῦτ' εἶχεν·
κ. τ. λ.
Ending, δεδωκατέ ἐπ' αὐτοῖς ἐκάστῳ τούτων.
De Contributione, 172.

1. How was the Macedonian Empire divided on the death of Alexander?
2. Give an account of the Chremonidean war.
3. What was the constitution of the Ætolian league? How and when did this league obtain power?
4. Enumerate some of the chief opinions held concerning the origin of the Ephoralty at Sparta? Grote mentions an ancient custom pointing to the popular origin of this magistracy?
5. What were the causes of the decay of Sparta?
6. What reforms have been generally ascribed to Lycurgus? Who originated the idea that he redistributed the land among the citizens? At what time is it most likely that he lived? What mistakes are made by Plutarch with respect to him?
7. What is the first piece of true history relating to Thebes?
8. What are the remarkable points in the history of Greece from B. C. 776 to B. C. 560?
9. What effect had the configuration of Greece upon the political relations of the inhabitants?
10. Give some examples of the demonstrative use of the Article in Attic Greek.

11. When is the subject not marked by the Article?
12. Give an account of the ways in which *ἀρα*, *γε* and *ἄν* are used.
13. What are the roots of the following words, and how do they appear in Greek :—*friend*, *thin*, *ankle*, *awe*, *hemp*, and *grow*?
14. What were the original forms of the accusative plural of the Greek noun and of the first aorist Participle Active, and illustrate these forms from the Greek dialects and the kindred languages?
15. Compare the case endings of the Greek with those of the Latin noun.
16. What were the original sounds of *ε* and *ο*?
17. Trace the steps by which the following pairs of words are connected with each other :—*κῶς*, *πῶς*; *βανα*, *γυνή*; *βάω*, *go*; and *κλυτός*, *loud*.

CICERO.

MR. GRAY.

Translate the following passages into English :—

1. *Beginning*, Nam et publicani, homines et honestissimi et ornatissimi, ...
Ending, neque aliis voluntas propter timorem.
Pro Lege Manilia, c. vii.
2. *Beginning*, At domicilium in Italia non habuit is, ...
Ending, id huic, summa ingenii prædito gloria, noluisse!
Pro Archia Poeta, c. iv., v.
3. *Beginning*, Ecce Dolabellæ comitiorum dies : sortitio prærogativæ : ...
Ending, quæ necesse est aliquando ad nostrum collegium deferantur.
Philippica Secunda, c. xxxiii.
4. *Beginning*, M. Fulcinius fuit, recuperatores, ...
Ending, ut frueretur una cum filio.
Pro A. Cæcina, c. iv.

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1. What are the three forms of the perfect active in Latin? Give examples from *each* of the four conjugations of the forms that occur in them.
 2. Conjugate the verbs from which the following participles come : *amictus*, *refertus*, *oblitus*, *fissus*; also, *sero* to plait, *sero* to sow, *texo*, *comminiscor*. Conjugate and give the meaning of *metior*, *mēto*, *mēto*; *operor*, *operio*, *opperior*.
 3. Distinguish between *frustra*, *nequidquam*, and *incassum*; and between *aut*, *vel*, and *-ve*.
 4. When is *quum* 'when' followed by the indicative, and when by the subjunctive? When does *quum* 'since,' 'because,' take the indicative, and when the subjunctive?
 5. Trace the course of the Via Appia, marking the principal towns. When and by whom was it constructed?

6. Explain the following words and phrases: *prærogativa*, *obnuntio*, *prævaricator*, *inquilinus*, *sectio*, *congiarium*, *legibus solutus*, *ego amplius sestertium ducenties acceptum hereditatibus rettuli*.

7. Quote Cicero's character of Cæsar as given in the second Philippic. He also states the importance of the island of Delos at that time?

8. Why was the prerogative of presiding in the *Judicia* so much coveted?

9. Trace the steps by which the Roman province of Transalpine Gaul was formed, and mention the principal colonies in it.

10. Give an account of the revolt of Saturninus. Merivale explains a certain obscurity in the accounts history has given of it?

11. State clearly the peculiar privileges of the *jus Latii* and the *jus Italicum*.

12. Mention, with their geographical boundaries, the provinces of the Roman empire under Sulla.

13. The various relations in which the different classes of the provincial population stood to the ruling city, have been compared with the constitution of a Roman household?

14. Sketch briefly the earlier career of Pompeius, and give an account, at some length, of his exploits in the East.

MR. ABBOTT.

Translate the following passage into Greek Prose:—

Beginning, It was the common boast of the Heathen philosophers, ...
Ending, to make men like gods, than gods like men.

SPECTATOR, No. 634.

Translate the following passage into Greek Verse:—

Beginning, I'll follow thee through sunshine and through storm;
Ending, Let but thy love be with me to the last.

TAYLOR, *Philip van Artevelde*.

Translate the following passage into Latin Lyric Verse:—

Beginning, Success to the heroes of gallant Castile, ...
Ending, Be welcom'd by Love and applauded by Fame.

HEMANS, *Song*.

Translate the following passage into Latin Prose:—

Beginning, Cicero died in his sixty-fourth year.
Ending, threw him still more out of harmony with that party.

LIDDELL, *History of Rome*, book VII. c. xliv. § 19.

EXAMINATION FOR THE BERKELEY MEDALS.

ODYSSEY OF HOMER.

MR. STACK.

Translate accurately the following passages :—

1. *Beginning*, ἐνθα δὴ νύκτας δύο τ' ἤματα κύματι πηγῶ, κ. τ. λ.
Ending, ἐξ ὁμόθεν πεφύωτας· ὁ μὲν φυλῆς, ὁ δ' ἑλαινῆς.
v. 388-477.
2. *Beginning*, αὐτὰρ ὁ τάμνετο δοῦρα· θοῶς δὲ οἱ ἦνυτο ἔργον, κ. τ. λ.
Ending, μοχλοῖσιν δ' ἄρα τήν γε κατειρυσεν εἰς ἅλα διαν.
v. 243-261.
3. *Beginning*, αἱ δ' ἱστοῦς υφώωσι καὶ ἡλάκατα στρωφῶσιν, κ. τ. λ.
Ending, παντοῖαι πεφύασιν, ἐπηετανὸν γανόωσαι.
vii. 105-128.

1. Write a brief sketch of the history of Homeric criticism.
2. In the discussion of the question as to the authorship of the *Iliad* and *Odyssey*, much stress is laid on the comparison of the *theology* of the two poems?
3. Estimate the value of the argument which proceeds on the difference in the states of social life represented, and give illustrations.
4. State the argument founded on the difference of language in the two poems. Give examples and illustrations.
5. Point out the leading points of difference which appear in the comparison of the Homeric and Hesiodic schools of poetry.

ODYSSEY OF HOMER.

DR. INGRAM.

Translate the following passages into English :—

1. *Beginning*, τὸν δ' ὅτε πίνοιεν μελιθδεία οἶνον ἐρυθρὸν,
Ending, οὐδ' ἄρ' ἔμελλ' ἐτάροισι φανείς ἐρατεινὸς ἔσσεσθαι.
ix. 208-230.
2. *Beginning*, 'Αλλ' ὅτε δὴ τὴν νῆσον ἐλείπομεν, οὐδέ τις ἄλλη, κ. τ. λ.
Ending, ἐζόμενος δ' ἐπὶ τοῖς φερόμην ὁλοοῖς ἀνέμοισιν.
xii. 403-425.
3. *Beginning*, "Ως ἄρα φωνήσας κέασε ξύλα νηλεῖ χαλκῶ· κ. τ. λ.
Ending, ἀργιόδοντος ὕος· κύδαινε δὲ θυμὸν ἀνακτος.
xiv. 418-438.

1. Consider the *geographical* expressions and indications in the *Iliad* and *Odyssey*, in relation to the question of the unity of their authorship.

2. *Ναιετάω δ' Ἰθάκην εὐδαιελλον· ἀμφὶ δὲ νῆσοι
Πολλαὶ ναιετάουσι μάλα σχεδὸν ἀλλήλοισι,
Δουλίχιόν τε, Σάμη τε, καὶ ὕλησσαν Ζάκυνθος·
Αὐτὴ δὲ χθαμαλὴ παννυπερτάτῃ εἰν ἀλὶ κεῖται
Πρὸς Ζόφον, αἱ δὲ τ' ἀνενθε πρὸς ἡῶ τ' ἡέλιόν τε.*

a. Explain *εὐδαιελλον*.

b. What is the difficulty respecting *Dulichium*?

c. And what respecting the situation of *Ithaca*?

3. Give the substance of *Buttmann's* philological remarks on the following sentences:—

- a. *Τῇ τόδῃ φάρμακον ἐσθλὸν, ἔχων δ' ἐς δώματα Κίρκης
Ἔρχετο.*

- b. . . . ἀδινὸν μυκώμεναι ἀμφιθέουσι
Μητέρας.

- c. *Τόσσην ἡλίβατον πετρὴν ἐπέθηκε θύρῃσιν.*

- d. *Καὶ παρέθηχ' ἐτάροισιν, ἀποξύναι δ' ἐκέλευσα.*

- e. *Κλαιόντεσσι δὲ τοῖσιν ἐπήλυθε νήδυμος ὕπνος.*

- f. *Ἦέ φιλόξεinoι, καὶ σφιν νόος ἐστὶ θεουδής.*

- g. . . . χερσὶν ἄωτον θεσπεσιόω
Νωλεμέως στρεφθεὶς ἐχόμεν.

4. "Plato expels Homer from his republic on account, amongst many others, of a well-known passage in the *Odyssey*." What is the passage here spoken of?

5. State and criticize the canon laid down by Dr. F. Thiersch concerning the digamma in such cases as the following:—

*εἰς Ἰθάκην· οὐδ' εἶδες ἐνὶ μεγάροισι γυναῖκα.
τεθναῖσιν· τιμὴν δὲ λελόγχασ' ἴσα θεοῖσι.*

ODYSSEY OF HOMER.

MR. ARBOTT.

Translate the following passages into English:—

1. *Beginning*, *Νῦν μὲν δὴ μάλα πάγχυ κακὸς κακὸν ἡγήλάζει· κ. τ. λ.*
Ending, *Πλευραὶ ἀποτρίψουσι δόμον κάτω βαλλομένοιο.*

ΧV. 217-232.

2. *Beginning*, *Αὐτίκα λαμπτήρας τρεῖς ἕστασαν ἐν μεγάροισιν, κ. τ. λ.*
Ending, *Αὐτὰρ ἐγὼ τούτοις φάος πάντεσσι παρέβω.*

ΧVI. 306-316.

3. *Beginning*, *Ἀλλὰ καὶ ὥς ἐρέω, ὥς μοι ἰνδάλλεται ἦτορ, κ. τ. λ.*
Ending, *Ἢ μὲν πολλαὶ γ' αὐτὸν ἐθήησαντο γυναῖκες.*

ΧVII. 224-235.

4. *Beginning*, "Ὡς φάτο Τηλέμαχος· μνηστῆρσι δὲ Παλλὰς Ἀθήνη, κ. τ. λ.
Ending, Οὐρανοῦ ἐξαπόλωλε, κακὴ δ' ἐπιδεδρομεν ἀχλὺς.
 xviii. 347-357.
5. *Beginning*, "Ὡς ἄρ' ἐφώνησεν· τῇ δ' ἄπτερος ἔπλετο μῦθος, κ. τ. λ.
Ending, Νωμῆ ἔνθα καὶ ἔνθα κακῶν ἔμπαιος ἀλήθης.
 xix. 386-400.
6. *Beginning*, "Ὡς ἄρ' ἔφη· καὶ πείσμα νεῶς κυανοπρώροιο, κ. τ. λ.
Ending, Χεῖράς τ' ἡδὲ πόδας κόπτον, κεκοτηότι θυμῷ.
 xx. 465-777.
7. *Beginning*, "Ὡ γύναι, ἥ μάλα τοῦτο ἔπος θυμαλγὲς εἶπες, κ. τ. λ.
Ending, Ἐκ δ' ἐτάνυσσα ἱμάντα βοδὸς, φοῖνικι φαινόων.
 xxiii. 183-201.
8. *Beginning*, Τὸν δ' οἶον πατέρ' εἶδεν εὐκτιμένῃ ἐν ἀλωῇ, κ. τ. λ.
Ending, Ἢ πρῶτ' ἐξερέοιτο, ἑκαστά τε πειρήσαιτο.
 xxiv. 225-237.

1. Give some account of the Greek commentators on Homer.
2. What reasons have been assigned for the rejection of the νεκρία in the twenty-fourth book? Where did the Grecian Odyssey terminate, according to Aristarchus?
3. The latter books contain several instances of what has been called the irony of Homer?
4. What is the connexion of the following circumstances with the development of the plot :—
 - a. The recognition by Euryclea :
 - b. The occurrence of the feast of Apollo on the day of slaughter of the victors?
5. The last of the passages given above exemplifies a characteristic feature of Homer's ethical mechanism, noticed by Moore?
6. Explain the peculiarities in Homer's use (a) of intransitive verbs, (b) of the conjunctive mood.
7. Write notes on the words ἐπίχεις, ἐννέωρος, ἦρα, κίσκετο, λέγως νόμος, οὐλος.

MR. STACK.

Translate the following passage into Homeric hexameters :—

Beginning, Deep in the shady sadness of a vale, ...

Ending, Was, with its storèd thunder, labouring up.

KEATS, *Hyperion*.

EXAMINATION FOR THE DEGREE OF BACHELOR IN MEDICINE.

ANATOMY AND PHYSIOLOGY.

PROFESSOR M'DOWEL.

1. Describe and contrast active and passive muscular contractility; and enumerate the stimuli which produce muscular action.
2. Describe briefly the chemical changes which take place in respiration.
3. Trace the sixth cerebral from its origin to its termination, and describe its relations.
4. Enumerate the relations of the superior vena cava.
5. Enumerate the fissures of the liver, and mention the objects contained in each of them.

SURGERY.

DR. SMITH.

1. Describe the areolar tumour of the breast, and its appropriate treatment.
2. There are three distinct forms of parotid inflammation; mention the seat of the disease in each. Under what circumstances does critical abscess occur in the parotid gland?
3. Describe the operations of Desault and Bécлар for the cure of fistula of Steno's duct.
4. Mention the causes of paralysis of the muscles of the shoulder. What method has been suggested, and by whom, of ascertaining whether it is likely to be followed by atrophy of the affected muscles or not?
5. Mention the characters of that form of bubo which Mr. Colles has described as being best treated by minute doses of mercury.

PRACTICE OF MEDICINE.

DR. BANKS.

1. What are the cerebral symptoms which may arise from saturnine intoxication?
2. What are the points of resemblance between acute phthisis and typhoid fever?—and in what respects do they differ?
3. What symptoms are common to Oriental plague and typhus fever?
4. What are the forms of psychical disturbance which sometimes occur after typhoid fever?

5. In which form of continued fever is jaundice most frequently met with?

6. When jaundice occurs in typhus fever, what influence has it on our prognosis?

INSTITUTES OF MEDICINE.

PROFESSOR LAW.

1. What are the chief differences between the pathological views of the Vienna School represented by Rokitsanski, the Berlin School represented by Virchow, and the French School represented by Cl. Bernard?

2. What is Garrod's experiment for the diagnosis of gout?

3. What are the structures chiefly affected in rheumatism, and what in gout?

4. From the structures affected, are we to infer that rheumatism and gout are distinct diseases, or that they are modifications of one and the same disease?

5. What proof is there that the diminution of size of the liver in cirrhosis is due to actual atrophy, and not to mere condensation or compression of the organ?

6. Which are the distant organs that suffer from heart disease?—and what are the lesions that accrue to these organs from such disease?

MATERIA MEDICA.

DR. OSBORNE.

1. Give the systematic and popular names of *indigenous* purgatives, astringents, and aromatics, and the best modes of preparing them for internal use.

2. State the first perceptible effect of mercury, and the changes produced by it on the blood when long continued.

3. State the substances by the application of which to the skin it is in your power to produce—1st, erythema; 2nd, vesicles; 3rd, pustules.

4. Corrosive sublimate and arsenic, considered as poisons, are contrasted—first, by the rapidity of their action; secondly, by the peculiarity of the vomiting produced; and, thirdly, by some concomitant symptoms?

5. The dose of corrosive sublimate, and the first symptom of irritation of the stomach produced by it?

6. By what secretions derived from the digestive apparatus of other animals have attempts been made to assist the process of digestion in the human subject?

MIDWIFERY.

DR. CHURCHILL.

1. Mention the various enlargements of the abdomen which may be mistaken for pregnancy; with the differential diagnosis of each.

2. What symptoms or circumstances counter-indicate the use of ergot of rye?
3. Describe the treatment of a case of rupture of the uterus.
4. How do you distinguish between polypus, prolapse, and inversion of the uterus?
5. Describe the mode of incursion, the symptoms, diagnosis, and treatment of pelvic hæmatocele.

MEDICAL JURISPRUDENCE.

DR. BRADY.

1. Contrast the putrefactive changes in a child dead *in utero*, and retained for eight or ten days, with those of a still-born child confined and buried for the same period.
2. Describe the distinctive characters of vital and post-mortem burns, referring to the fallacies that may present themselves in certain cases.
3. What method would you adopt for the detection of blood stains on dress, furniture, weapons, &c.?
4. State a good differential test of arsenic and antimony deposited in Marsh's tube.
5. What process would you adopt for the detection of bichloride of mercury in matters vomited, or in the contents of the stomach?

CHEMISTRY.

DR. APJOHN.

1. What is understood by the mean temperature of a place?—what are the means by which it is determined?—and what is the effect of altitude upon it?
2. Assuming the latent heat of water to be 142° , and that of steam to be 212° , how much steam would be necessary to melt 10 lbs. of water?
3. A lamina of zinc and one of copper immersed near each other in a dilute acid, and connected by a suitable interpolar, give rise to what is called an electric current; why will two slips of zinc, with same acid and interpolar, not give such a result?
4. Describe the gold-leaf electrometer; and explain how with the aid of a stick of excited sealing-wax you would give it an electric charge.
5. Give the process for preparing liquor arsenicalis, and the volumetric method of ascertaining its strength.
6. Write the formula of prussic acid, and that of Prussian blue; and give the successive steps of the process by which the former may be converted into the latter.
7. Nitrogen may be obtained by boiling a solution of nitrate of ammonia, or by passing chlorine into a solution of ammonia; what is the rationale of each of these processes?

8. Describe the methods of insulating the narcotine, morphia, codeia, and meconic acid of opium; and how to distinguish between the permeconate and persulphocyanide of iron.

9. How is the analysis of the serum of blood best made?—and what is the process of Andral and Gavarret for determining the respective weights of its fibrin and globules?

10. Mention the name, and write the composition, of the principle in bile which reacts upon the sugar in applying Pettenkoffer's test.

BOTANY.

DR. HARVEY.

1. What is the product of fertilization in a Fern?
2. Describe the usual structure, position, and functions of *stomata*; giving instances of plants in which they are frequently inactive.
3. Describe the usual appearance and structure of wood-tissue (*pleuroenchyma*), and the changes that take place in its structure as it advances in age.
4. Why is it that the Talipot Palm must infallibly perish after having brought its inflorescence to maturity?
5. How does the pollen of a Heath (*Erica*) differ from ordinary pollen?
6. What are the usual explanations given of a free-central placenta?
7. What is the position of the embryo in a Cocoa-nut?
8. How are *Mimoseæ* distinguished from other *Leguminosæ*?
9. What are the botanical characters and principal medical plants of *Convolvulaceæ*?
10. Distinguish the two principal suborders of *Myrtaceæ*, naming illustrative genera of each suborder.
11. How are *Dioscoreaceæ* known from *Smilaceæ*?
12. Refer the plants before you to their natural Orders, and write a description of any one of them according to the following formula:—
 - (a) *Stem*, General character.
 - (b) *Leaves*, Arrangement.
 - (c) ——— Stipulation.
 - (d) ——— Composition.
 - (e) ——— Form.
 - (f) ——— Margin and incision.
 - (g) Venation.
 - (h) *Inflorescence*, General character.
 - (i) ——— Bracteal appendages.
 - (j) *Flower*, Peculiarities of calyx.
 - (k) ——— ——— corolla.
 - (l) ——— ——— stamens, noticing insertion.
 - (m) ——— Disk.
 - (n) ——— Pistil, as to ovary, style, stigma, and placentation.
 - (o) *Fruit*, General character, dehiscence, placentation.
 - (p) ——— Arrangement of embryo in seed.
 - (q) Reasons for referring a specimen to a particular Order; general characteristics of the Order, and its geographical distribution.

EXAMINATION FOR DEGREE OF MASTER IN SURGERY.

PROFESSOR ADAMS.

1. Will you give me a description of the articular disease familiarly termed "white swelling," as it affects the knee-joint; the early symptoms; the anatomical characters also of the disease in its early stages?
 2. Suppose a case of chronic enlargement of the bursa, in front of the patella, about the size of a large orange; what will you find to be its structure and contents, and what would you consider the best mode of operation to relieve the inconvenience felt from it?
 3. Suppose a case of strangulated femoral hernia, about the size of a hen-egg, requiring relief by an immediate division of the stricture; how will you proceed to divide the skin and the several subjacent strata safely, which are found successively to present themselves, before the knuckle of strangulated intestine is itself arrived at?
 4. How do you become certain that it is the intestine itself which is in view, and that you have divided the true hernial sac formed of peritoneum?
 5. Does the circumstance of the patient being a male or a female at all influence the operative proceedings?
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ANATOMY AND PHYSIOLOGY.

PROFESSOR M'DOWEL.

1. Mention the relations of the thyroid gland, and describe its minute structure.
 2. Describe the development and order of union of the vertebral osseous elements.
 3. Give the relations and assign the function of the inferior laryngeal nerves.
 4. The relations of the fascia iliaca.
 5. Mention the blood-vessels which are divided, and those which are endangered, in the removal of half of the lower maxilla.
 6. Describe the arytenoid cartilages, and their relations.
 7. The peculiarities of the ribs in each of the sub-kingdoms of the vertebrata.
 8. The chemical composition of fatty matters, and their uses in the animal economy.
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SURGERY AND SURGICAL PATHOLOGY.

DR. SMITH.

1. What bones are most frequently the seat of circumscribed abscess? In what part of the bones does it generally occur? Mention the signs

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and symptoms indicating its existence. What is the chief danger of the disease? Who described its occurrence in the head of the tibia? Mention the causes of the affection.

2. Who described "sudden abscess"? In what states of the system does it arise? What are the characters of the matter? How does the disease terminate?

3. What forms of iliac abscess have been described by Velpeau?

4. Mention the local causes which retard or prevent the union of fractures. What diseases of a constitutional character have the same effect? and, amongst these, is there any capable of destroying union already completed? Mention the modes of treating disunited fractures. Who introduced the treatment by seton?

5. What circumstances accompanying a simple fracture would be likely to render amputation necessary?

6. What is the nature of the affection of the breast, occasionally met with in new-born children?

7. Mention the chief circumstances that contra-indicate the operation for cataract.

8. There are two forms of luxation of the bones of the fore-arm forwards at the elbow; mention the characters of each.

9. Enumerate the varieties of congenital hydrocele.

10. How would you treat encysted hydrocele of the spermatic cord?

11. Who gave the first account of *spontaneous* hæmatocele? What other name has been given to the disease? What is the pathology of the affection? Contrast its treatment with that of *traumatic* hæmatocele.

12. Explain the natural cure of congenital hernia.

13. Mention the different forms of dilatation of veins as given by Briquet.

14. What is Breschet's classification of aneurism by dilatation? Give the anatomical characters of circoidal aneurism.

CHEMISTRY.

DR. APJOHN.

1. How would you distinguish aqueous solutions of oxalic, tartaric, and citric acids?

2. Aqua lauro-cerasi, unless kept from contact with air, becomes turbid; how is this explained?

3. A salt may require to be kept in a tight bottle from one or other of three causes; what are these?

4. How would you ascertain whether a protosulphate of iron contained any persulphate, and whether the persulphate contained any protosulphate?

5. Describe and explain the process for making the tinc. ferri peracetatis.

6. Give the process for preparing what is called ammoniæ hydrosulphuretum. Write the formula which represents its composition. State the first change which it experiences by exposure to the atmosphere, and the actions which muriatic acid exerts upon it, and which it exerts on sulphate of copper.

7. What are the means by which you would ascertain whether oil of vitriol was arsenical, or whether it contained nitrous acid?

8. Explain the successive steps of the process for searching for arsenic in the liver.

9. What is the effect of adding water to butter of antimony, and how may such effect be prevented?

10. How is soluble tartar made?—what is its formula?—and what the effect of adding to a solution of it in water a few drops of acetic acid?

BIBLICAL GREEK PRIZE EXAMINATION.

PROFESSOR SIDNEY SMITH.

Book of Numbers (LXX.).

1. Write brief notes on the following passages:—

a. καὶ ἐπηξονούσαν κατὰ γενέσεις αὐτῶν κατὰ πατρίας αὐτῶν.

b. καὶ ἐπιθήσουσιν αὐτὴν ἐπ' ἀναφορέων.

c. ἀκάθαρτον ἐπὶ ψυχῇ.

d. ἀλλ' ἢ ἐν φάσματι δείξει Κύριος.

e. ἀλλὰ τὸ πρᾶγμα οὐδὲν ἐστὶ, παρὰ ὅρος παρελευσόμεθα.

2. What is the difficulty arising from comparing the census in the beginning of Numbers with the poll-tax in Exodus xxxviii., and the solution of it?

3. καὶ λήψῃ πέντε σίκλους κατὰ κεφαλὴν, κατὰ τὸ δίδραχμον τὸ ἄγιον λήψῃ, εἰκοσι ὀβολοὺς τοῦ σίκλου. An objection to the historic truth of the Pentateuch, derived from the mention of the Shekel of the Sanctuary, may be answered from this passage?

4. To what purpose was the ἄγιον δίδραχμον applied?

5. Καὶ ἐγένοντο πάντα. τὰ πρωτότοκα τὰ ἀρσενικὰ κατὰ ἀριθμὸν ἐξ ὀνόματος ἀπὸ μηναίου καὶ ἐπάνω ἐκ τῆς ἐπισκέψεως αὐτῶν, δύο καὶ εἴκοσι χιλιάδες καὶ τρεῖς καὶ ἐβδομήκοντα καὶ διακόσιοι. How does Kurtz deduce the number of boys in each family from this passage?

6. And what is his answer to the objection hence arising?

7. An objection has been taken from the extent of the sacrifices of the seventh month, Num. xxix., to the truth of the narrative; how is it to be answered?

8. ποιείτωσαν οἱ υἱοὶ Ἰσραὴλ τὸ πάσχα. It is erroneous to say that this required 150,000 lambs?

9. πρὸς ἐσπέραν corresponds to a much-disputed phrase in Hebrew; what is the sense of it, as derived from the Mishna?

10. Was the blood of the Paschal lamb sprinkled on this occasion by the priests?

11. What were the circumstances under which (according to Leviticus) blood was sprinkled by the priests?

12. What modes are there of reconciling the different statements as to the number of the Levites?

13. "They shall not go in to where the holy things are covered, lest they die." How in the LXX., and why?

14. "To vow a vow of a Nazarite." How expressed in the LXX.?

15. "And Aaron shall offer the Levites before the Lord." How is this in the Greek?

16. What is meant by the Levites being "waved"?

17. ἐγὼ εἶληφα τοὺς Λευίτας—ἀντὶ παντὸς πρωτοτόκον διανόιγοντος μήτραν. This has been interpreted as including two requisites as to those instead of whom the Levites were to be taken, and thus furnishing an answer to the objection?

18. Can you state how the Hebrew confirms this view that there were two distinct requisites intended?

19. Deut. xxi. 15, 16. "If a man have two wives, . . . he may not make the son of the beloved firstborn before the son of the hated, which is indeed the firstborn." This furnishes an argument as to the meaning of πρωτοτόκος?

20. "Take the sum of the sons of Kohath . . . from thirty years even until fifty." An objection has been made from comparing this with the statement in the eighth chapter, and how answered?

21. Give Hengstenberg's view.

22. "Thou mayest be unto us instead of eyes." How in LXX.?

23. Did Hobab comply with the request of Moses?

24. πῦρ παρὰ Κυρίου κατέφαγε μέρος τι τῆς παρεβολῆς. Bochart shows that the Hebrew means something different from this?

25. "Leeks." Hengstenberg understands this differently, and considers the word a proof of historical accuracy?

26. What errors have been made by rationalistic critics as to the seventy elders? What other appointments of seventy persons are recorded in the Pentateuch?

27. προφήτευσαν καὶ οὐκ ἔτι προσέθεντο. Explain these words, and the difference from the Hebrew.

28. What was Ludolph's opinion as to ὀρυγομήτρα?

29. ὥσει δίπηχυ ἀπο τῆς γῆς. The meaning seems to be settled by a passage in the Psalms?

30. ὁ ἄνθρωπος Μωυσῆς πρὸς σφόδρα. What other meanings may the Hebrew words have, and what changes in the sense thence result?

31. τῆς γυναικὸς τῆς Ἀιθιοπίσσης. Write a note on the words.
32. οὐχ οὕτως ὁ θεράπων μου Μωσῆς ἐν ὅλῃ τῇ δικῇ μου πιστός ἐστι. State the manner in which the passage is used in the Epistle to the Hebrews, and its place in the argument there. What is οἰκος?
33. στόμα κατὰ στόμα λαλήσω—καὶ τὴν δόξαν Κυρίου εἶδε. What is the meaning of the Hebrew word answering to δόξα?—where else does it occur?—and what is the supposed reference of the passage?
34. ἐπυνόμασε Μωσῆς τὸν Ἀυσὴ υἱὸν Ναυῆ Ἰησοῦν. What modes of explaining the historical difficulty here?
35. State Pearson's view of this change of name in its relation to that of our Lord.
36. γῇ κατίσθιουσα κατοικοῦντας ἐπ' αὐτῆς ἐστίν. In what sense to be taken?
37. καὶ Χεβρὼν ἐπὶ τὰ ἔρεσιν ψκοδομήθη πρὸ τοῦ Τανὶν Ἀιγυπτου. Write a note on this.
38. ἐπειρασάν με τοῦτο δέκατον. Enumerate the occasions supposed to be referred to.
39. "Your carcases shall fall in this wilderness." What are the arguments relating to the question whether the tribe of Levi was included in this sentence?
40. Were Eleazar and Ithamar included?
41. "Ye shall know my breach of promise." Give the LXX., and discuss the correctness of this rendering.
42. "They presumed to go up to the hill top." How in the Greek?
43. "Now Korah—and Dathan and Abiram—and On took men." Give Kennicott's translation of this, and that of the LXX.
44. Two passages in the history of Korah's rebellion are used by St. Paul; in what connexion?
45. a. "Ye take too much on you, ye sons of Levi."
 b. "I have not taken one ass from them."
 c. "Every thing devoted in Israel shall be thine."
- Give the Greek in these places.
46. State what inconsistencies are alleged to exist in the history of Korah, and the reply of Kurtz (including the difficulty about Korah's children).
47. How does Kurtz explain the silence of Scripture as to the incidents during the thirty-seven years' ban?
48. How does he regard the stations mentioned in Numb. xxxiii., and their relation to Kadesh?
49. What corroborative passages are found in Deuteronomy?
50. What references to this period are supposed to exist in Ezekiel and Amos?
51. καὶ λογισθήσεται ὑμῖν τὰ ἀφαιρέματα ὑμῶν ὡς σῖτος ἀπὸ ἡλω καὶ ἀφαίρεμα ἀπὸ ληνοῦ. Explain ἀφαίρεμα; and show how the passage throws light on the signification of λογίζω.
52. What seems to have been the sin of Moses at Kadesh?

53. "When King Arad heard tell that Israel came by the way of the spies." Our English version here, "the way of the spies," is not in accordance with the Hebrew, taken in strict grammar?

54. Mention briefly the difficulty with respect to Kadesh. Were there two of the name, or only one?

55. How does Hengstenberg reply to those who assert the identity of the miracle at Meribah with that at Kadesh?

56. What is the discovery made by Rowlands as to the site of Kadesh? and what is Robinson's opinion?

57. Prove that the Israelites encamped twice at Kadesh?

58. What chronological difficulty is there in the account of the conflict with King Arad? and what is Hengstenberg's solution of it?

59. *ὄφιν χαλκοῦν*. What remarkable appellation of it is found in the Book of Wisdom?

60. "Wherefore it is said in the book of the wars of the Lord, what he did in the Red Sea, and in the brooks of Arnon." Write a note on this passage, giving the rendering by which Kennicott removes the difficulties of Hobbs and Spinoza, and the interpretation of Hengstenberg.

61. In the song of Israel at the well, give Kennicott's translation, and the particulars in which the LXX. differs from the E. V.

62. Mention the boundaries of Moab, Gilead, and Bashan.

63. What was the position of *'Αραβῶθ Μωδβ*? and how is it shown to be different from the field of Moab, *πεδῖον Μωδβ*?

64. State the three points from which Balaam delivered his prophecies. What is known of their localities?

65. What is known of Nebo, Pisgah, Abarim?

66. "Falling into a trance, but having his eyes open." What reason is there for thinking that the LXX. is more correct here?

67. "There shall come a star out of Jacob, and a sceptre shall rise out of Israel, and shall smite the corners of Moab, and destroy all the children of Sheth." What corrections have been proposed in the translation?

68. State the reasons of Kurtz for the Messianic interpretation.

69. "The children of Sheth." How to be understood?

70. Explain *'Αμαλήκ, ἀρχὴ ἰθινῶν*.

71. *Ἰδὼν τὸν Κεναῖον*. What nation is to be understood here?—and how in relation to it are to be explained the words, *'Ασσύριοι ἀίχμαλ-τεύσουσι σε*?

72. Write notes on the following passages:—

a. *ὄυκ ὡς ἄνθρωπος ὁ θεὸς διαρτηθῆναι*.

b. *ὄυδ' ὡς υἱὸς ἀνθρώπου ἀπειληθῆναι*.

c. *ἐὰν γένηται τῷ Βεὼρ νοσοῖα πανουργίας*.

d. *παραδειγματίσον αὐτοὺς Κυρίῳ*.

II. *Corinthians.*

1. "Behold, the third time I am ready to come to you." What mistakes have been made as to the sense?

2. Whence arises the difficulty of supposing that Paul had paid two visits to Corinth ere this?

3. No visit took place between the sending of I. Cor. and II. Cor.?

4. What internal evidence is there in favour of an unrecorded visit to Corinth?

5. *αὐτοὶ ἐν ἑαυτοῖς τὸ ἀπόκριμα τοῦ θανάτου ἐσχέκαμεν.* Is there any other instance of the grammatical anomaly here? Give the sense of the words.

6. *ἵνα ἐκ πολλῶν προσώπων τὸ εἰς ἡμᾶς χάρισμα διὰ πολλῶν ἐνχαρισθηθῇ ὑπὲρ ἡμῶν.* Give the three possible constructions, pointing out why the E. V. is the best.

7. i. 17-20. "When therefore I was thus minded, did I use lightness? or the things that I purpose, do I purpose according to the flesh, that with me there should be yea, yea, and nay, nay?"

"But as God is true, our word toward you was not yea and nay.

"For the Son of God, Jesus Christ, who was preached among you by us, even by me and Silvanus and Timotheus, was not yea and nay, but in him was yea.

"For all the promises of God in him are yea, and in him Amen, unto the glory of God by us."

Give a paraphrase of this passage, pointing out the varieties of opinion, and correcting the E. V. where necessary.

8. *ὅν δέδοξασται τὸ δεδοξασμένον ἐν τούτῳ τῷ μέρει ἕνεκεν τῆς ὑπερβαλλούσης δόξης.* Give the three constructions of the passage.

9. "For until this day remaineth the same vail untaken away in the reading of the Old Testament, which vail is done away in Christ." State the amended translation, and show why the E. V. is held to be incorrect.

10. "And not as Moses, which put a vail over his face, that the children of Israel could not steadfastly look to the end of that which is abolished." The interpretation here has been obscured by a mistranslation of the parallel passage in Exodus; state it.

11. Give the corrected rendering of this passage in Cor. "The vail shall be taken away"—in what sense?

12. Give the corrected translation of the following passage:—

"But we all, with open face beholding as in a glass the glory of the Lord, are changed into the same image from glory to glory, even as by *the Spirit of the Lord.*"

13. The words in italics admit of various renderings?

14. *τὸ εὐαγγέλιον—ἐν τοῖς ἀπολλυμένοις ἐστὶν κεκαλυμμένον.* In what sense does Alford take the Dative?

15. Winer gives another sense?

16. *ὑπὲρ τῆς θλίψεως, κ. τ. λ. ἐν τῇ Ἀσίᾳ.* Write a note on this.

HILARY TERM.

17. *τῇ γὰρ πίστει ἰστήκατε.* Winer gives a force to the Dative here differing from that in the E. V. ?

18. How is the Dative used in the following passages ?—

a. The weapons of our warfare are *δυνατὰ τῷ Θεῷ.*

b. *ἐκρίνα δὲ ἱμαντῷ τοῦτο.*

c. *ἢτε ἐξίστημεν Θεῷ, ἢτε σοφρονοῦμεν ὑμῖν.*

d. *ταύτη πεποιθήσει βουλόμην ἔλθειν, κ. τ. λ.*

19. *ἐι δὲ τις λελύπηκεν, οὐκ ἐμὲ λελύπηκεν ἀλλὰ ἀπὸ μέρους ἵνα μὴ ἐπιβαρῶ πάντας ὑμᾶς.* Give Alford's view and translation, correcting the E. V.

20. State also the view of Olshausen, and that adopted by the Vulgate.

21. *τῷ δὲ Θεῷ θριαμβεύοντι.* In what sense is this to be taken ? Give the parallel in Colossians, and its meaning.

22. "In whom the god of this world hath blinded the minds of them that believe not." What was the early interpretation of the words ?

23. Explain, and give the Greek of, "to give the light of the knowledge of the glory of God in the face of Jesus Christ."

24. *τὴν νέκρωσιν τοῦ Ἰησοῦ ἐν τῷ σώματι περιφέροντες.* Alford differs here from the view of Peile ?

25. "Death worketh in us, but life in you." Give the sense, and say why the opinions of (a) Olshausen, (b) Chrysostom, and (c) Meyer are to be rejected.

26. *κατὰ τὸ γεγραμμένον ἐπίστευσσα διδὲ ἑλαλησα.* Give the context of the passage in the Psalms.

27. *iv. 15. τὰ γὰρ πάντα δι' ὑμᾶς, ἵνα ἡ χάρις πλεονάσασα διὰ τῶν πλειόνων τὴν εὐχαριστίαν περισσεύσῃ εἰς τὴν δόξαν τοῦ Θεοῦ.* What are the possible renderings, and the merits of each ?

28. *v. 1. οἶδαμεν γὰρ, ὅτι ἐὰν ἡ ἐπίγειος ἡμῶν οἰκία τοῦ σκήνους καταλυθῇ, οἰκοδομῇ ἐκ Θεοῦ ἔχομεν οἰκίαν ἀχειροποίητον, αἰώνιον ἐν τοῖς οὐρανοῖς.* How is the passage held by some to relate to the question of an intermediate state ?

29. *v. 2. καὶ γὰρ ἐν τούτῳ στενάζομεν, τὸ οἰκητήριον ἡμῶν τὸ ἐξ οὐρανοῦ ἐπενδύσασθαι ἐπιποθοῦντες.* What was the hope in the mind of the Apostle ?

30. *v. 3. εἴ γε καὶ ἐνδυσάμενοι, οὐ γυμνοὶ, εὐρεθησόμεθα.* How are *εἴγε* and *εἴπερ* to be distinguished ?

31. Give Alford's interpretation of the verse.

32. What objection lies to that of Grotius ?

33. De Wette's rendering, "seeing that when we are also (really) clothed, we shall not be found naked," is objectionable ?

34. What was the view of the ancients, Chrysostom, Theodoret, &c. ?

35. *v. 4. καὶ γὰρ οἱ ὄντες ἐν τῷ σκηνί στενάζομεν βαρούμενοι· ἐπειδὴ οὐ θέλομεν ἐκδύσασθαι, ἀλλ' ἐπενδύσασθαι, ἵνα καταποθῇ τὸ θνητὸν ὑπὸ τῆς ζωῆς.* The E. V. of this passage, how corrected by Alford ?

36. γ. 7. διὰ πίστεως γὰρ περιπατοῦμεν, οὐ διὰ εἰδους. Explain this, correcting the E. V.

37. γ. 8. θαρροῦμεν δὲ καὶ εὐδοκοῦμεν μᾶλλον ἐκδημῆσαι ἐκ τοῦ σώματος, καὶ ἐκδημῆσαι πρὸς τὸν Κύριον. Alford differs from Meyer; give the view of each.

38. γ. 9. Διὸ καὶ φιλοτιμούμεθα, εἴτε ἐκδημοῦντες, εἴτε ἐκδημοῦντες εὐάρεστοι αὐτῷ εἶναι. What is the objection to the ordinary rendering?

39. Give Alford's, De Wette's, and Meyer's.

40. "We thus judge, that if one died for all, then were all dead; and that he died for all, that they which live should not henceforth live unto themselves," &c. If the E. V. were correct, what should have been the Greek?

41. Write a note reconciling this with the following passages:—

οὐ δικαιωθήσεται ἐξ ἔργων νόμου πᾶσα σὰρξ—τίς ἐγκαλίσσει κατὰ ἐκλεκτῶν Θεοῦ;

42. In what sense are we to understand "they which live"?

43. Correct the E. V. in the sentence, "God was in Christ, reconciling the world," &c.

44. τὸν μὴ γνόντα ἁμαρτίαν ὑπὲρ ἡμῶν ἁμαρτίαν ἐποίησεν ἵνα ἡμεῖς γενώμεθα δικαιοσύνη Θεοῦ ἐν αὐτῷ. οὐ γνόντα would mean something different?

45. In what sense is μὴ γνόντα to be taken?

46. Lev. vi. 25. οὗτος ὁ νόμος τῆς ἁμαρτίας. Does this passage seem to justify Alford's reference to it?

47. How does the course of thought in the argument bear on the question whether ἁμαρτία = sin-offering?

48. βλέπω γὰρ ὅτι ἐπιστολὴ ἐκείνη εἰ καὶ πρὸς ὥραν ἐλύπησεν ὑμᾶς. Give the different views as to the sense of this.

49. Write notes on the following verses:—

viii. 10. "And herein I give my advice: for this is expedient for you, who have begun before, not only to do, but also to be forward a year ago."

11. "Now therefore perform the doing of it; that as there was a readiness to will, so there may be a performance also out of that which ye have."

12. "For if there be a willing mind, it is accepted according to that a man hath, and not according to that he hath not."

50. Speculations about the "brother whose praise is in all the churches"?

51. Etymology and meaning of ἀδρότης.

52. "He hath dispersed abroad, he hath given to the poor; his righteousness remaineth for ever." Illustrate the true meaning by a passage in the Gospels?

53. Discuss the sense of the following passage:—

ix. 13. "Whiles by the experiment of this ministration they glorify God for your professed subjection unto the gospel of Christ, and for your liberal distribution unto them and unto all men."

54. Write an explanatory paraphrase of the following passage :—

x. 12. "For we dare not make ourselves of the number, or compare ourselves with some that commend themselves : but they, measuring themselves by themselves, and comparing themselves among themselves, are not wise."

13. "But we will not boast of things without our measure, but according to the measure of the rule which God hath distributed to us, a measure to reach even to you."

14. "For we stretch not ourselves beyond our measure, as though we reached not unto you : for we are come as far as to you also in preaching the gospel of Christ."

15. "Not boasting of things without our measure, that is, of other men's labours ; but having hope, when your faith is increased, that we shall be enlarged by you according to our rule abundantly,"

16. "To preach the gospel in the regions beyond you, and not to boast in another man's line of things made ready to our hand."

55. ἀλλ' ἐν παντὶ συνιστάντες ἑαυτοὺς ὡς Θεοῦ διάκονοι. "In all things approving ourselves as the ministers of God." Correct the E. V. here.

56. How does the Greek phrase distinguish between the sense here and that in the sentence, "Do we begin again to commend ourselves" ?

57. What is the exact meaning of στενοχωρία ?

58. ἐπιστεῦσα διὸ ἐλάλησα, ἐγὼ δὲ ἐταπεινωθην σφοδρά. ἐγὼ δὲ εἶπα ἐν τῇ ἐκστάσει μου, Πας ἄνθρωπος ψεύστης. Explain the application made of these words of the Psalmist by St. Paul ?

59. Explain the passage itself in the Psalms ; giving the E. V., and the probable connexion between the latter clause and the former.

60. ὡς πλάνοι καὶ ἀληθεῖς, ὡς ἀγνοοῦμενοι καὶ ἐπιγινωσκόμενοι. State the difficulty in interpreting these phrases, as compared with the rest of the passage, and Alford's view.

61. ἡ καρδία ἡμῶν πεπλάτυνται. Give the sense, and the different views about it.

WRAY PRIZE EXAMINATION.

BUTLER'S ANALOGY.

DR. MALET.

1. What does Butler mean by our *original* need of improvement in virtue? Show—

a. That we need to guard against two distinct evils.

β. That this coincides with the view of human nature opened to us by the Christian dispensation.

γ. That, from Butler's view, serious difficulties arise concerning a future state, and how these difficulties are obviated ?

2. State Butler's various objections to the sufficiency of the light of nature; and expand and illustrate each of them.

3. We are precluded from objecting to any portion of Christ's mediatorial office on account of its seeming inadequacy to the end proposed; state fully how Butler shows this.

4. What definite form does the question of the evidence of Christianity necessarily take. Hence what objections only can be alleged against it? and how does Butler refute them?

5. Give an analysis of Butler's views respecting our incapacity of judging beforehand of what should have been expected in Scripture.

BUTLER'S SERMONS.

MR. POOLE.

1. Butler shows that the whole of virtue cannot be resolved into *benevolence*. State his arguments.

2. His analysis of *compassion* seems to include somewhat faulty—and how does he show that this is not really the case?

3. Point out why *resentment* is more restricted as to its gratification than any other *particular affection*.

4. State generally Butler's line of argument in order to prove that God is not, in the proper sense, the author of either *moral* or *physical* evil in the case of man.

5. How does Butler show that *self-love* does not wholly deceive men as to their conduct?—and state his illustrations of the conduct of those influenced by it.

6. To what does Butler attribute the persuasion that there is some peculiar opposition between *benevolence* and *self-love*? He points out the errors involved in this; and urges the claims of *benevolence* on the ground of *self-love*?

7. Does he consider our knowledge to be limited only by our natural capacities? and what account does he give of our position in this respect?

8. Butler intimates by a distinction between the parts composing the constitution of nature where we may expect to meet apparent defects, and shows that we have reason to believe them to be only apparent?

MILL.

MR. POOLE.

1. Dr. Whewell objects to Mr. Mill's view that his principle of the correctness of the different conceptions used in *colligation of facts* is not true of the *explanation of facts*. How does he argue?—and state Mr. Mill's reply to him, and the instances used as examples.

2. Mr. Mill disputes the view entertained by some as to what *efficient causes* really are. State his argument, and his account of the origin of the error.

3. Compare Malebranche's and Leibnitz' views as regards the constitution of the world, with the opinion opposed by Mr. Mill, alluded to in the last question.

4. Discuss the law of induced electricity as an example of three of the Inductive Methods.

5. Comte agrees with Mr. Mill as to the nature and use of *hypotheses* for the discovery of the laws of phenomena; state them. Illustrate their opinions by the case of the hypothesis of a luminous ether; and also their difference from Dr. Whewell.

6. State the two cases of *intermixture of effects*. Which of these can be submitted to the experimental method for discovery of causes; and how are these causes ascertained in this case?

7. State Mr. Mill's argument against accepting the truth of *universal causation*, on the ground of *intuitive belief*, as fully as you can. Butler agrees with him in one important principle which he employs? Does Mr. Mill appear to you to go too far in his opinion?

8. To what does Mr. Mill trace Locke's error in considering reasoning as only the comparison of two *ideas* by means of a third, and knowledge as the perception of the agreement or disagreement of two *ideas*?—and whence did its plausibility arise?

LOGICS OF THE SENIOR FRESHMAN YEAR.

DR. DICKSON.

1. State and discuss the psychological distinction between thought and intuition.

2. What is the true psychological account of the principle of substance and the principle of cause, according to Mansel?

3. Reid's appeal to *fundamental laws of human belief* is no answer to the philosophy of Berkeley and of Hume?

4. How is Logic related to Grammar, Psychology, and Metaphysics?

5. Write the substance of Bacon's remarks upon the *ars indicii*.

6. What are the principles of Bacon's *interpretatio naturæ*?

7. The views of Bacon, *de arte retinendi*, anticipated in some important respects those of later writers?

7. What part is occupied by the Will in Stewart's psychological system?—and how does he employ it to explain the phenomena of *habit*, *memory*, and *dreaming*?

Trinity Term.

WALL BIBLICAL SCHOLARSHIP EXAMINATION.

CRITICISM OF GENESIS, I.-IV., XXII.-XXIV.

MR. LONGFIELD?

1. i. 24. : תוצא דמאין נשט דיה למינה בומה ורמש דחוראין למינה :

a. How is the form דמאין explained by Gesenius? How is it accounted for by Dr. Wall?

b. How far does the latter explanation derive support from the LXX. and Peschito versions?

a. Do the ancient versions give any support to the opinion that the number of the noun in the form למינה, in the second place where it occurs in the passage, is plural?

2. iii. 8. : ויהונתן האדם וישורו מפני יהוה אלהים בתוך עץ הדן :

a. How do the Hebrew and Hebræo-Samaritan texts of this passage differ, and how is the difference to be accounted for?

b. What evidence is furnished by the LXX. and Peschito versions, and the Targums, as to the original state of the text of the passage.

3. iv. 26. : אן דהיל לקא בָּשָׁם יְהוָה :

a. Give the rendering of this passage by the LXX., and explain fully how it was derived from the original.

b. Translate Jonathan's paraphrase of the passage :

הוא דא דא דביומא שריא למסע ועבדי להון מעען ומננן לשעוהון בשם
מיסדא דיי :

4. xxiii. 5, 6. : ויענו במרחות את אברהם לאמר לו : שמענו אדני נשיא
אלהים אלה וכו' :

a. What reason is there for supposing that the suffixed ' in the word אדני is an interpolation? What evidence on the point is furnished by the LXX. and Peschito versions?

b. What fact as to the suffix of the first person singular is indicated by the interpolation in this passage?

c. With respect to one word in this passage the Samaritan text differs from the Masoretic? Which is probably correct? What inconsistency does the Samaritan text exhibit?

ECCLESIASTICAL HISTORY PRIZE EXAMINATION.

THE EPISTLES OF S. IGNATIUS.

THE PROFESSOR OF ECCLESIASTICAL HISTORY.

1. Bishop Pearson enumerates four Collections of the Ignatian Epistles?
2. (a). How many Epistles bear the name of S. Ignatius?
(b). Of these how many spurious?
(c). How many in Latin only, and to whom addressed?
(d). Date of the first publication of three Latin Epistles?
3. Ignatian Epistles when, where, and by whom, first published in Greek? Mention the editor's real, as well as his assumed, name.
4. To what passage in the Epistle to the Smyrnæans do we owe the investigations and discoveries of Abp. Ussher?
5. Why did Ussher seek especially in England for MSS. of the Epistles?
6. Date and place of publication of Ussher's edition of the Ignatian Epistles?
7. Had he not previously *printed* for the first time some document connected with these Epistles?
8. From what MS. did Isaac Vossius publish the Greek text of the Epistles, and when?
9. What does Abp. Ussher's *Appendix Ignatiana* contain?
10. Who first published the Latin Acts of the Martyrdom of S. Ignatius?
11. The Greek Acts, together with one of the Epistles, were set forth by whom, and when?
12. To what date does Mr. Cureton wish to assign the Syriac version of the three Epistles which he first published in the year 1845?
13. In what light should we regard the recension which the Syriac version represents?—and to what age does it really belong, according to Archdeacon Churton and others?
14. Mr. Cureton (*Corp. Ignat.* p. 186.) ascribes to Beda (A. D. 701.) a work which is known not to have been composed before the tenth century?
15. In what respect are the third and fourth editions of Hefele's *Patrum Apostolicorum Opera* much superior to the earlier impressions, published in the years 1839 and 1842?
16. Which of the Ignatian Epistles is most frequently cited by ancient writers?
17. How did it happen that S. Ignatius was especially opposed to the Docetæ?

18. Ussher and others have argued against the genuineness of the Epistle to Polycarp on the ground that the people of Smyrna are addressed in the sixth section of it. How is this objection answered?—and can you cite verses from the Apocalypse, in which anything similar appears with respect to S. Polycarp and his people?

19. What word used by Eusebius, and translated by S. Jerom, may be adduced to prove that Abp. Ussher was not justified in rejecting the Epistle to S. Polycarp, while he admitted the genuineness of the other six Ignatian Epistles?

20. Only one of the ancient writers confounds the Epistle to the Smyrneans with that to Polycarp?

21. How may the error into which Abp. Ussher fell, respecting the Epistle to S. Polycarp, be possibly accounted for?

22. Ἐκκλησία ἀγία . . . ἦν καὶ ἀσπάζομαι ἐν τῷ πληρώματι, κ. τ. λ. (*Ep. ad Trall.* ad init.) Can these words be illustrated by a remarkable verse in S. Paul's Epistle to the Ephesians?

23. Ὅς . . . ἐβαπτίσθη, ἵνα τῷ πάθει τὸ ὕδωρ καθάρισθ. (*Ad Ephes.* §. xviii.) Similar passage in our Baptismal Service?

24. Καὶ ὑμῖν δὲ πρέπει μὴ συγχρᾶσθαι τῇ ἡλικίᾳ τοῦ ἐπισκόπου . . . καθὼς ἔγνω καὶ τοὺς ἀγίους πρεσβυτέρους, οὐ προσειληφότες τὴν φαινομένην νεωτερικὴν τάξιν. (*Ad Magnes.* §. iii.)

(a). Translate this passage.

(b). Explain the words, συγχρᾶσθαι, προσειληφότες, and νεωτερικὴν τάξιν.

(c). In what verse only in the New Testament is the verb συγχράομαι employed?

(d). How is the last expression interpreted by the adversaries of Episcopacy?

25. Λόγος ἀπίδος, οὐκ ἀπὸ σιγῆς προελθών. (*Ad Magnes.* §. viii.)

(a). Give an account of the controversy concerning this passage, which Mr. Cureton (*Corpus Ignatianum*, Introd. p. lxiii.) considers "so very strong, and indeed almost an undeniable argument" against the genuineness of the Shorter Recension of the Ignatian Epistles.

(b). If there be not here any allusion to the tenets of the heretic Valentinus, can you explain the words with reference to the doctrine of any sect connected with the Jews?—Quote two striking verses from the Book of Wisdom, relative to "Silence" and the "Almighty Word."

26. In the Salutation prefixed to the Epistle of S. Ignatius to the Romans, a strange alteration in this passage— . . . ἐκκλησία . . . ἥτις καὶ προκαθῆται ἐν τόπῳ χωρίου Ῥωμαίων—has been proposed, by means of which S. Ignatius would be made to teach that the Roman Pontiff is the Vicegerent of God?

27. In the same Salutation, how does Hefele translate the words, προκαθήμενη τῆς ἀγάπης, so as to make S. Ignatius appear to state that the Church of Rome presides over the whole body of Christians?

28. Socrates, in his Ecclesiastical History, (vi. viii.) informs us, that the practice of chanting in churches was introduced by S. Ignatius. Can you refer to the passage in his Epistle to the Romans, in the Greek of

which Mr. Cureton (*Corp. Ignat.* p. 293.) supposes that some alteration was made, with a view to favour this notion?

29. ... ἵνα ὃν κατάκριτος ὡς Ἀπόστολος ὑμῖν διατάσσωμαι. (*Ad Trall.* §. iii.)—Οὐχ ὡς Πέτρος καὶ Παῦλος διατάσσωμαι ὑμῖν. (*Ad Rom.* §. iv.)—Baratier founds an argument on the former, and Whiston on both, of these passages, relative to a celebrated ancient document?

30. Οὐχ ὅτι παρ' ὑμῖν μερισμὸν εὔρον, ἀλλ' ἀποδυνλισμένον. (*Ad Philadelph.* §. iii.) What is Hefele's reading for the last word?—and where does διῦλιζόντες occur in the Gospel of S. Matthew?

31. . . με, ὡς προειδότα τὸν μερισμὸν τινων. (*Ad Philad.* §. vii.)—Dr. Jacobson objects to Abp. Wake's translation of προειδότα? How do you understand the word?

32. Ἐπεὶ ἤκουσά τινων λεγόντων, ὅτι ἐὰν μὴ ἐν τοῖς ἀρχαίοις εὔρω, ἐν τῷ εὐαγγελίῳ οὐ πιστεύω· καὶ λέγοντός μου αὐτοῖς, “ὅτι γέγραπται,” ἀπεκρίθησάν μοι, “ὅτι πρόκειται.” (*Ad Philadelph.* §. viii.)

(a). Translate and explain this passage.

(b). In the earlier editions of his work, Hefele had adopted a reading which he afterwards corrected?

(c). Abp. Wake's translation of the first clause?

(d). Vossius derives an argument from one interpretation of these words, relative to corruptions in copies of the Hebrew Scriptures?

(e). Various senses of the last word?—Meaning assigned to it by Dr. Routh?

33. Καὶ ὅτε πρὸς τοὺς περὶ Πέτρον ἦλθεν, ἔφη αὐτοῖς, “Λάβετε, ψηλαφήσατέ με, καὶ ἴδετε, ὅτι οὐκ εἰμι δαιμόνιον ἀσώματον.” (*Ad Smyrn.* §. iii.)

(a). Why is it extremely unlikely that these words were taken by S. Ignatius from the Gospel according to the Hebrews, though S. Jerom states that such was the case, and Ussher and Valesius agree with him?

(b). They were to be found in another apocryphal document, which Hefele supposes to have been their source?

(c). Whence, in the opinion of Bp. Pearson and Casaubon, were those words derived?

(d). Upon what passage in Scripture does the narrative seem really to rest?

(e). Can you in any way account for the mention made of S. Peter by S. Ignatius upon this occasion?

34. S. Ignatius has been reproved because that in one recension of his Epistles the names of certain heretics appear. Of what has he been accused?—and how is the charge shown to be groundless?

35. Why did the Gnostics abstain from the celebration of the Eucharist? (*Ad Smyrn.* §. vi.)

36. S. Ignatius (*Ad Smyrn.* §. v.) would not receive commendation from any one who should call him Θεοφόρος, while refusing to grant another name to his Divine Master? How does he designate such a person?

37. Mention the earliest and the second occasion, on which we find the epithet "Catholic" applied to the Church of Christ.

38. Τὸ θίμα ἀφθαρσία καὶ ζωὴ αἰώνιος. (*Ad Polyc.* §. ii.)—Meaning of the word *θίμα*? What is Milner's absurd translation of it in his *Church History*, Cent. ii. Chap. i.?

39. (a). In the time of S. Ignatius, the Assemblies of Christians were called by a name which, S. Augustin (On Psalm lxxxii.) tells us, the Apostles did not use?

(b). Can it be shown that S. Augustin was mistaken?

(c). Another word was afterwards employed, and the former name disused? and why?

40. Εἰ τις δύναται ἐν ἀγνείᾳ μένειν . . ἐν ἀκαυχησίᾳ μὲνέτω . . καὶ ἰὰν γνωσθῇ πλέον τοῦ ἐπισκόπου, ἔφθαρται. (*Ad Polyc.* §. v.)—What meaning does Dr. Jacobson put upon these words?

41. Selden's opinion, expressed in his *Uxor Hebraica*, (ii. 28.) with regard to the celebration of Marriages by the Clergy, is confuted by a passage in the Epistle to S. Polycarp?

42. The word *θεόδρομος*, which occurs in the Epistle to Polycarp, (§ vii.) has been misinterpreted both by those who reject the Ignatian Epistles, and by Cardinal Baronius (ad an. lviii. n. cii.)?

43. . . . δι' ὀλίγων ὑμᾶς γραμμάτων παρεκάλεσα. (*Ad Polyc.* §. vii.)—What is Bp. Pearson's inference from these words?—and can you quote an expression from S. Paul's Epistle to the Galatians, which shows that the argument is not conclusive?

44. How did the Latin translation of the term *θεομακαριστότατι*, which occurs in the Epistle to S. Polycarp, (§. vii.) lead Bp. Pearson to suppose that the old Latin version was made before the year 650?

45. With reference to this last point, Archdeacon Churton remarks, (i. 112.) that the posthumous notes of Bp. Pearson, published by Smith, in one of which this argument is found, are not as valuable as those parts of that Prelate's work which he himself had perfected. Is there any definite way in which Bp. Pearson's oversight may be accounted for?

46. Author, title, and date of the principal work in which the Ignatian Epistles were assailed?

47. Date of Bishop Pearson's crushing reply?

[The remainder of the Examination was conducted *vis à voce*.]

EXAMINATION FOR LICENSE IN ENGINEERING.

THEORY OF THE STEAM-ENGINE.

MR. GALBRAITH.

1. In the equations which express the condition of a double-acting engine in uniform motion, what are the values of the quantities e and k ?
2. Calculate their numerical values for an expansion of one-half, the clearance being supposed equal to one-twentieth.
3. Calculate the horse-power of a condensing engine from the following conditions:—

Diameter = 80 inches.
 Revolutions = 18 per minute.
 Stroke = 6 feet.
 Evaporation = 2 cubic feet.
 Expansion = one-half.

4. In this case, what is the value of the pressure in the cylinder before the steam is cut off?
5. Deduce an expression for the diameter of cylinder in inches of a condensing engine working with steam of low pressure, in terms of the evaporation, expansion, horse-power, and velocity of piston.
6. Prove the following expression for the horse-power:—

$$H. P. = \frac{42CS}{11000} \left(k - e \frac{p + f + \gamma}{P' + \gamma} \right).$$

7. Prove that the maximum horse-power for a given expansion corresponds to the least possible velocity.
8. What is the expansion which corresponds with the absolute maximum horse-power?
9. Express the velocity of the piston of a locomotive in feet per minute, in terms of the velocity of train in miles per hour; also the pressure of steam in the cylinders due to the weight of train, in terms of the number of tons in the engine, tender, and carriages on a level rail.
10. How must this expression be modified if the train ascend or descend a gradient of 1 in n ?

MR. M. ROBERTS.

1. A wall of brickwork (weighing 112 lbs. per cubic foot), 2 ft. 3 in. thick, and 23 ft. high, sustains on the inner edge of its summit a certain pressure on every foot of its length; the direction of the pressure is inclined to the horizon at an angle of 65° . Find its amount when it will just not overthrow the wall.

2. In the last question, if the pressure is applied by means of a bracket at a horizontal distance of 2 ft. 6 in. from the inner edge of the wall, determine the amount when it will just not overthrow the wall.

3. Two rafters, AB, AC, are each 24 ft. long, and their feet are tied by a wrought iron rod whose length is 40 ft.; a weight of $\frac{3}{4}$ ths of a ton is suspended from A. Find the strain on the tie. If the rod have a section of $\frac{3}{8}$ ths of a square inch, find the weight suspended from A which will break the tie. [The tenacity of wrought iron is 67,200 lbs. per square inch.]

4. Determine the elongation of a steel bar, $2\frac{1}{2}$ in. square and 35 ft. long, when subjected to a strain of 50 tons. [The modulus of elasticity is 29,000,000.]

5. A river wall of Aberdeen granite (specific gravity 2.625), whose section is a right-angled triangle, and whose hypotenuse is turned towards the water, just supports the pressure of the water when its surface is on a level with the wall. If the thickness of the base is 12 ft., what is the height of the wall?

6. A wall of Portland stone, 25 ft. high and $1\frac{1}{2}$ ft. thick, has to sustain on each foot of its length a thrust equal to a weight of 3 cub. ft. of stone, acting in a direction inclined to the vertical at an angle of 60° . Find the point of a bracket to which this pressure must be applied so that the line of resistance may cut the base 3 in. within the extrados.

7. A mass of earth (specific gravity 1.6), whose surface is horizontal, presses against a revêtement wall of brickwork whose section is rectangular; the top of the wall is on the level of the ground, and its height is 18 ft. If the natural slope of the earth is 30° , find the requisite thickness of the wall to enable it to sustain the pressure of the earth.

8. A beam fixed at one end only has a uniform load of intensity w , and an additional load W at the extreme end of the projecting portion; find the greatest bending moment.

MINING, AND USE OF THE BLOWPIPE.

PROFESSOR HAUGHTON.

1. Describe the blowpipe characters of red stilbite.
2. Describe the physical and blowpipe characters of tinstone.
3. How is gadolinite distinguished from the minerals that most nearly resemble it; and what are they?
4. Name the important earthy constituents that the blowpipe fails to detect readily.

* 5. Give the blowpipe characters of barytocalcite.

6. The underlay of East Pool, South Lode, is $24^\circ 30'$ N. from grass for 105 fathoms, when it reaches the granite, and changes its underlay to 40° N., along the junction of the granite and slate, for $88\frac{1}{2}$ fathoms; what is the total depth of the lode at this point.

* 7. At Pedn-an-drea mine, the underlay of the Engine lode is 37° N., and that of Martin's lode, which lies 25 fathoms to the south of it, is $46^\circ 30'$ N. At what depth will these two lodes intersect?

* 8. A diagonal shaft was found to underlay and measure as follows :—

No.	Draft.	Underlay.
1	54 feet.	+ 18° 45'
2	42 "	+ 12 15
3	69 "	+ 25 0
4	96 "	- 7 30

Find the depth of the end of shaft, and the point at which a perpendicular shaft should be commenced to reach the end.

* Questions marked thus count double.

In addition to the preceding examination, the Candidates were examined orally on the principles of Geology and Mining, and were required to produce Geological sections made by themselves in the field.

CHEMISTRY AND MINERALOGY.

DR. APJOHN.

1. Calculate the proportions of nitre, oil of vitriol, and water, necessary to yield 16 avoirdupois ounces by weight of nitric acid, having the formula $\text{HO}, \text{NO}_5 + 3\text{HO}$.

2. Give the reactions which occur during the solution of silver and of bismuth in nitric acid.

3. Terchloride of gold may be reduced by oxalic acid, green vitriol, and arsenious acid. Describe the reactions which occur in each of these cases.

4. 100 lbs. of a magnesian limestone, containing nothing but carbonate of lime and carbonate of magnesia, left when burned 54.15 lbs. What is its atomic composition?

5. Explain the process by which chlorine is developed, and the products formed when the gas is passed into a solution of green vitriol.

6. How would you prepare hydrogen and arseniatted hydrogen?—and, if these gases were mixed, how would you determine the amount of each?

7. Describe the chemical operations by which the value of a hydraulic lime may be estimated.

8. If a gallon of water includes 7 grains of lime and 4 grains of magnesia, what is its degree of hardness?

9. Describe minutely the manner of making the analysis of bone earth.

10. How would you prepare nitrous oxide?—and how by the voltaic eudiometer would you effect its analysis?

11. Gypsum is often found as a six-sided prism, terminated at each end by oblique dihedral summits. Give the formula of the mineral, and the notation of its faces.

12. In what particulars do diopase and chrysocolla agree, and in what do they differ?

13. A mineral from Glenarm, having the form of a hexangular dodecahedron, the apices and basal edges of which were tangentially truncated, was found by Rammelsberg to have the following composition:—

Silex, ...	46.40
Alumina, ...	21.09
Lime, ...	3.67
Soda, ...	7.29
Potash, ...	1.60
Water, ...	20.41
	100.46

Describe the mode of effecting its analysis, and give its formula, its name, and the notation of its different faces.

14. Give the formulæ and crystalline systems of the following minerals:—

1. Electric calamine.
2. Glance copper.
3. Mispickel.
4. Sparry iron ore.
5. Bournonite.
6. Malachite.

15. How is galena smelted, and what is the theory of the process?

DR. DOWNING.

1. Calculate the horizontal strain in the top and bottom flanges in either of the two wrought iron main girders in a bridge for carrying a single line of railway over a river. Clear span, 126 ft.; depth of beam, 11 ft.; weight of each main girder, 29.5 tons; total moving load when the bridge is covered, 149.5 tons; total weight of the rails, cross girders, sheeting of timber, and gravel, 39.5 tons. The computation to be made as in Mr. E. Clark's large model.

2. Compute the available area in the top and bottom flanges at the centre, necessary to meet the requirements of the Board of Trade in this bridge.

3. If the above be constructed as a lattice beam, and the first diagonal rising from the abutment make 45° with the horizontal; calculate, with the above data, the compression produced in it, and the requisite transverse section of metal.

4. If the camber of the bottom flange be made 2 inches at the centre of a wrought iron girder, 140 ft. span, calculate its amount at 20 ft. and at 35 ft. from the centre, the curve being an arc of a circle.

5. Prove the following Rule for determining the quantity of water in gallons per 24 hours, delivered from the catchment basin draining into an impounding reservoir:—

$$40,000 \times M \times I = \text{gallons in 24 hours;}$$

M being the area in square miles, I the depth in inches of the available rain-fall.

6. Calculate the discharge of a pipe 32 in. in diameter, having a fall of 150 ft. in 12 miles.

7. Calculate the number of cubic yards in an excavation having the following dimensions:—Width at formation level, 18 ft.; slopes, $1\frac{1}{2}$ to 1,

$$\begin{array}{ccccccc} & 35 \text{ ft.} & & 49 \text{ ft.} & & & 47 \text{ ft.} \\ & \uparrow & & \uparrow & & & \uparrow \\ < \dots 110 \text{ ft.} \dots \times \dots 350 \text{ ft.} \dots \times \dots 290 \text{ ft.} \dots \times \dots 89 \text{ ft.} > \end{array}$$

8. Calculate the land required for the above cutting, without including fencing; and if the fencing be 4 yds. on each side, compute the additional quantity of land.

9. A stream being completely dammed up, and the discharge taking place altogether by a sluice, prove that the height to which the water is raised above the sill of the sluice, which height is represented by H , has the following value:—

$$H = \frac{Q^2}{S^2} \times 0.04065,$$

in which S is the area in square feet of the sluice.

10. If the discharge, as in Question No. 9, took place over the crest of weir whose length is l feet, prove that the rise of the water above the crest, represented by H , is

$$H = 0.429 \sqrt[3]{\left(\frac{Q}{l}\right)^2}.$$

11. In the case of the piers of a bridge, or other partial obstruction, let L , V , and S be the width, velocity, and transverse area of the river uninfluenced by the obstruction, and l , v , and s the corresponding values at bridge; the depth at s being p , and that at S being $p + x$, or, in other words, x being the surface fall at the site of the work. Prove that

$$x = \frac{Q^2}{2g} \left(\frac{1}{m^2 l^2 p^2} - \frac{1}{L^2 (p+x)^2} \right),$$

m being the coefficient of contraction.

12. Describe, in full detail, the method of ranging the centre line of a tunnel on the surface between the two points chosen for the entrances; and also the method of transferring this line to the headings below.

13. In a tunnel through solid rock, describe and sketch the method of carrying on the excavation, and securing the ventilation; stating the rate of progress that may be expected in the various parts of the work, and the position of the bedding of the rock most favourable in a tunnel.

14. In a tunnel through clay, describe and sketch the method of timbering up the different lengths, describing the technical terms used.

15. Deduce the modulus of elasticity, in lineal feet and in pounds weight, for wrought iron when in extension, and the same when under compression.

16. Two bars of wrought iron, each 3 inches broad and $1\frac{1}{2}$ thick, were compressed until they began to sink down, one having 10 ft. length with 46,050 lbs., the other 7.5 ft. long with 91,746 lbs.; calculate the power of the length to which the ultimate strength is proportional.

17. Again, of two bars of wrought iron, of the same length, namely 7.5 ft., one, being 3 inches broad and $\frac{1}{2}$ inch thick, broke with 3501 lbs. the other, 3 inches broad, $1\frac{1}{2}$ inches thick, with 91,746 lbs.; calculate the power of the thickness to which the strength is proportional.

18. Hence prove (using the average indices deduced from the experiments of which the above are examples) that similar pillars, or plates used as pillars, have their strengths proportional to the square of their like lineal dimension.

19. Being required to report on the compliance or non-compliance of the deposited Map and Section of a proposed line of railway as to Standing Orders, state fully the various points to which attention should be directed.

20. Describe the different methods of specifying the quality of wrought iron for girders; and give a statement of the chief points to be attended to in specifying the workmanship of the top, bottom, and sides, of plate and lattice girders.

21. Describe the three descriptions of cast iron from the character of the appearance of the surface of fracture; stating the Nos. which are given to each, and the different purposes to which they are severally best applied.

22. Draw up a specification for a piled foundation, with timber platform for the pier of a bridge, as in that of one of the piers of London Bridge.

23. Give the specification and description of a coffer-dam, consisting of a single row of piles for the abutments of a bridge in a tidal and navigable stream, as that at Bow Bridge.

24. Prove that in any equilibrated polygon of rods, free to move at the angles, and without friction, the horizontal thrust is constant; and also that the weights at the several joints are proportional to the sines of the angles between the rods, divided by the product of the sines of the angles into which the vertical from the joint divides the angle between the bars.

25. Calculate the diameter of a pipe to convey 1000 cub. ft. of water per minute, at a velocity of 2.5 ft. per second, and the inclination at which it is laid to give this discharge.

26. Calculate all the dimensions of a channel the depth of water flowing in which is 3 ft., the slopes of the sides 2 to 1, and conveying 3000 cub. ft. per minute, at a velocity of one mile per hour.

27. Draw the curve of equal horizontal thrust, or line of pressure, through the voussoirs of a segmental arch 28 ft. span, 6 ft. rise, and having 1 ft. 6 in. depth at the key; assuming any points at the springing and at the key through which it is supposed to pass.

28. Calculate the horizontal thrust in the arch in No. 27, when built of granite; and give the proof of the formula applied.

29. Calculate the ultimate strength of a cast iron beam, 28 ft. in clear span; depth at centre, 2 ft.; area of bottom flange, 12 in. wide by $1\frac{1}{2}$ in. deep.

30. Calculate the area of the bottom flange required at the points 6 ft. from the centre at each side, the ultimate load being uniformly distributed, the area at the centre being as in No. 29; the depth at these points being 1 ft. $10\frac{1}{2}$ inches.

31. Draw up the specification of a timber bridge for a railway, and specify for the test of the driving of the piles.
32. Give the specification for building a weir across the bed of a river, the bottom being a clayey gravel.
33. Draw up the specification of a turnpike road.
34. Draw up the specification of a river wall, faced with granite, backing of brickwork, foundation on clay, height of wall 25 ft.

EXAMINATION FOR MEDICAL EXHIBITIONS.

PROFESSOR LAW.

1. What are the arguments that may be adduced in favour of the opinion that typhus and typhoid fever are essentially different diseases?
2. What are the arguments that may be adduced in favour of the opinion that they are modifications of one and the same disease?
3. Describe the modifications of respiration, as indicated by the stethoscope, in the course of a case of acute pleurisy terminating in effusion, which effusion is eventually removed either by absorption or operation.
4. What are the objections to Laennec's explanation of the phenomenon of egophony?
5. What is the rationale of Valsalva's treatment of aneurism?
6. What is the pathognomonic sign of gangrene of the lung?
7. Who first described the colourless softening of the brain?
8. What surgical operation confirmed the correctness of his view of the nature of this lesion?
9. Who first described red softening of the brain?
10. With what cardiac affections are these cerebral lesions not unfrequently associated?
11. What is the proof that the fluid contained in the pleura in a case of pneumo-thorax is not the contents of a vomica that has emptied itself into this cavity?
12. Upon what condition of the lesion in a case of pneumo-thorax does the degree of distress of the patient, and the more or less speedy issue of the case, depend?

SURGERY.

PROFESSOR SMITH.

1. Mention the cases in which you would deem it proper to open the trachea. In what cases would you prefer performing the operation of laryngotomy? Enumerate the signs and symptoms which denote the presence of a foreign body in the air passages.

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2. If, in performing the operation of castration, the cord has been accidentally allowed to retract before its vessels have been tied, and alarming bleeding results, what course of proceeding would you adopt?

3. Enumerate the secondary affections consequent upon gonorrhœa. How would you treat inflammation of the prostate gland resulting from this cause? What constitutional disease most frequently gives rise to prostatic irritation of a temporary nature?

4. Describe a case of extravasation of urine, resulting from rupture of the urethra by external violence; and mention the treatment you would have recourse to.

PRACTICE OF MEDICINE.

DR. BANKS.

1. Enumerate the varieties of continued fever.
2. State the chief points of distinction between typhus fever and inflammation of the brain and its membranes.
3. How is the prognosis in typhus fever influenced by age?
4. What remedial measures would you adopt in states of insomnia in fever?
5. What are the diseases in which secondary pneumonia is most likely to occur?
6. What treatment would you employ in asthenic pneumonia?

MIDWIFERY.

DR. CHURCHILL.

1. What danger would arise if the axes of the uterus and brim of the pelvis were not in accordance?
2. What accident might result from too great prominence of the promontory of the sacrum?
3. What do you mean by the "beats" and "sounds" of the heart, and how many of each are there per minute?
4. Is the "placental souffle" a proof of a child being "in utero"?
5. Suppose you were called to see a lady complaining of headach, with cedema of the face and hands, and whose urine contained albumen, what would you fear at the time of labour, and what prophylactic treatment would you adopt?
6. You are called to a lady under the following circumstances:—She is eight months pregnant; had a discharge of blood at the seventh month, which has just recurred. What would you fear as to the cause, and how would you determine upon the nature of the case?
7. If, in such a case, you found that the placenta were situated near the fundus, but that the liquor amnii had been evacuated, what treatment would you adopt?

8. If you were called to a case of violent epileptic convulsions at the commencement of a first labour, before the os uteri was dilated, what treatment would you adopt?

MEDICAL JURISPRUDENCE.

DR. BRADY.

1. Describe a process for the detection of opium in organic mixtures.
2. State the purposes for which the preparations of arsenic, mercury, and phosphorus are employed in the arts, and the constitutional symptoms to which they respectively give rise.
3. State the different sources from which medical evidence may be derived in death by poisoning.
4. Describe the symptoms of poisoning with belladonna.
5. What method would you adopt in investigating the nature of suspected blood-stains on linen and woollen cloths?

UNDERGRADUATE HONOR EXAMINATION PAPERS.

Trinity Term.

SENIOR SOPHISTERS.

Ethics.

DR. MALET.

1. How does Butler trace self-deceit to its various sources? Where lies its *peculiar* province? What, then, was remarkable in the case of David? and how is it to be accounted for? How do you show that the temper itself is essentially vicious and immoral? and what illustrations does Butler give of this last point?

2. State the reflections suggested by the observation of our own ignorance; and enlarge *especially* on the third, namely, what is the proper business of mankind.

3. What is the *kind* of argument by which (in second Sermon) Butler enforces man's obligation to virtue? Why is it peculiarly strong when applied to the nature of man? and what are the cautions to be considered in applying it?

4. In what sense only can man be said to be, by nature, a law to himself? and what other meanings of the words does Butler mention, and show to be inapplicable to St. Paul's words?

BUTLER'S ANALOGY, AND ARISTOTLE.

MR. POOLE.

1. Discuss the relation of *natural* religion to *revealed*, pointing out the unfairness of the Deistical argument against revelation founded on *natural* religion.

2. State Butler's arguments for the preference of *moral* precepts to *positive* ones, when both cannot be obeyed.

3. Show that Butler regards Divine revelation as in many respects analogous to the light of nature, when viewed as a source of true knowledge.

4. Miracles, considered as interferences with the ordinary course of nature, may be viewed in two different lights: in which of these does Butler seem to regard them? and give proofs.

5. The evidence of Christianity appears weaker than it really is if we confine our view to Butler's arguments. He acts consistently with the design of the "Analogy" in omitting the strongest proof?

6. How does he argue as to the fair mode of determining the fact of a *prophecy* in Scripture being really such? State how the question is affected by partial ignorance of the meaning of a prophecy, and give his illustrations of the treatment of such a case?

7. Butler notices objections which may be brought against the argument from analogy, as used in defence of revelation; he shows that they are inconclusive, and points out a latent unfairness in them?

8. Contrast Aristotle's mode of viewing human virtue with that of Butler, pointing out their chief distinctions.

9. Πρὸς δὲ γὰρ αὐτοὶ μᾶλλον πεφύκαμεν πως, ταῦτα μᾶλλον ἐναντία τῷ μέσῳ φαίνεται. Οἷον αὐτοὶ μᾶλλον πεφύκαμεν πρὸς τὰς ἡδονὰς διὸ εὐκατάφοροί ἐσμεν μᾶλλον πρὸς ἀκολασίαν ἢ πρὸς κοσμιότητα, Ταῦτ' οὖν μᾶλλον ἐναντία λέγομεν, πρὸς δὲ ἡ ἐπίδοσις μᾶλλον γίνεται.

This passage might seem to assert a great corruption of human nature. Show that this is not so from the last clause; and explain Aristotle's meaning.

BUTLER AND CICERO.

DR. DICKSON.

1. Butler considers and answers three objections which have been made against the present life being a state of probation for a future?

2. If it be permitted to judge from analogy, we can determine our state hereafter in some important respects?

3. Discuss the question, Whether, and how far, analogy can be a safe guide (*a*) in practice and (*b*) in speculation?

4. Give at some length the views of the Platonists and Stoics as to the soul's existence hereafter.

5. Both differed from Butler as to the probable development of the future being?

6. The different speculative views of Plato and Aristotle respecting matter had an important influence on their ethical systems?

7. What is the objection of the Fatalist to the proof of religion from the will and character of God; and how does Butler reply?

8. In general, what proofs of religion would be undisturbed by the scheme of necessity, even if it were true; and why?

History and English Literature.

HISTORY.

PROFESSOR BARLOW.

1. What view does Mr. Hallam take of the character of Louis IX.?
2. Write a short abstract of the history of France from the commencement of the insurrection of the *Maillotins* till the year 1392.
3. Give an account of—(a) the massacre of Vassy; (b) *la paix mal assise*; (c) the battle of Moncontour.
4. What were the proceedings of the states-general at Blois in the reign of Henry III.?
5. Give some account of the administration of Colbert.
6. Date, and principal measures, of the ministry of Maupeou, d'Aiguillon, and Terray?
7. What authority is there for the story of the imprisonment of Edward IV., after the battle of Banbury, by the Earl of Warwick?
8. According to Mr. Hallam, the reign of James II. may be divided by several distinguishing points of time, which make so many changes in the posture of government?
9. Give an account of the great dispute in 1668 about the original jurisdiction of the House of Lords.
10. Burnet, speaking of the restoration of Charles II., remarks that "to the king's coming in without conditions may be well imputed all the errors of his reign." What is Hallam's opinion, and what are his reasons for it?
11. Write a short sketch of the life of Sir Edward Coke.
12. Also of Canute the Great.

Experimental Physics.

CHEMISTRY AND CRYSTALLOGRAPHY.

DR. APJOHN.

1. If ammonia be added to a solution of chloride of mercury, a white precipitate is formed. Two different rational formulæ have been proposed for it; what are they?
2. If to 2NO_4 in the liquid state four atoms of water are added, two distinct liquid strata are produced; what is the composition, and what the colour of each?

3. When a mixed solution of chloride of iron, nitrate of potash, and muriatic acid is boiled, NO_2 is disengaged; explain the reaction.

4. 100 volumes of the gases produced when ammonia is passed through a porcelain tube, containing coils of platinum wire ignited to whiteness, were mixed with 60 volumes of oxygen, and exploded by the electric spark; and the residue left after the explosion was 47.5 volumes. Name the gases which composed the original mixture, and the volume of each.

5. The entire of the iodine of the iodide of potassium is not precipitated by sulphate of copper; what is the reason of this, and why is the precipitation rendered complete by the addition of sulphurous acid?

6. If ternitrate of bismuth or terchloride of antimony be dropped into water, a white precipitate forms; what in each case is the nature of the precipitate, and how are they distinguished from each other?

7. What is the reaction between chlorine and ammonia, the latter being in excess?—and what that between iodine and ammonia?

8. A pint of water, impregnated with sulphide of hydrogen, required for its decomposition 114.8 measures of the volumetric solution of iodine, including in 100 measures $\frac{1}{10}$ th of an atom in grains of iodine. Infer from this the volume of sulphide of hydrogen absorbed by the pint of water.

9. The chlorine developed by muriatic acid from 4 grains of commercial manganese, separated from iodide of potassium a quantity of iodine requiring for the discharge of its colour 84.5 measures of the volumetric solution of hyposulphite of soda, including in 100 measures $\frac{1}{10}$ th of an atom of the hyposulphite. What percentage of pyrolusite did it include?

10. Explain how you would determine by experiment the amount of sulphuric acid, and of the respective bases, in a mixture of the native sulphates of barium and strontium.

11. A mixture of barytes and strontites weighs, in the form of chlorides, m grains; and, in the form of sulphates, n grains. What is the amount of each base?

12. Describe the mode of making the analysis of an alloy of copper, tin, and zinc; and assuming the percentage results of the analysis, to be

Copper, ...	62.25
Zinc, ...	31.91
Tin, ...	5.79

99.95

what is its atomic constitution?

13. Explain what is meant when a crystal is said to be uniaxial or biaxial; and specify the uniaxial and biaxial systems.

14. Give the names of the hemihedral forms of the hexangular system, and the notation of each.

15. A compound form is sometimes met with which is an icosihedron, with two kinds of faces; in what system does it occur, and what is the notation of its dissimilar planes?

HEAT AND ELECTRICITY.

PROFESSOR GALBRAITH.

1. Describe the construction and principle of Dr. Wollaston's cryophorus.
2. Nitrogen gas is collected in a jar over water, the number of cubic inches is 4.75, the column of water in the jar stands 9.6 inches above the level of the bath; calculate the weight of gas if the temperature of the air be 60° ($f=0.52$), the height of the barometer 29.56 inches, and the density of nitrogen = 0.972.
3. What weight of steam will be required to raise by its condensation a bath of 56 gallons of water from 55° to 82° ?
4. If the combustion of 55.5 grains of anthracite melts one ounce *av.* of ice in a calorimeter, calculate by the chain rule the power of the coal in converting water at 60° into steam at 212° .
5. Give an account of Dr. Wells' experiments on which he founded his theory of dew.
6. Describe the principle of the method of oscillations, and show how it may be used to compare the intensity of the Earth's magnetism at different places.
7. What are the expressions for the intensities of the principal, partial, and derived currents?
8. When the internal and external resistances are equal, prove that the intensity in the interpolar is a maximum.
9. Describe the construction and principle of the voltameter, in which the mixed gases are collected. What is the specific gravity of the mixture?
10. What is the relation of the dip and magnetic latitude, according to Biot's theory?

Classics.

PLATO.

MR. GRAY.

Translate the following passages into English :—

1. *Beginning*, Ταῦτα πάντα, ἔφη, ὃ φίλε Σώκρατες, κ. τ. λ.
Ending, ἑλκτίον ἐξόπισθεν κερδαλίαν καὶ ποικίλην.
De Republica, lib. II. c. viii.
2. *Beginning*, Ποῖα δὲ, ἔφη, ταῦτα; Ὁ μὲν μοι δοκεῖ, κ. τ. λ.
Ending, ὅ τι μὴ παιδιᾶς χάριν. Εἰκός, ἔφη.
Ib., lib. VII. c. viii.

3. *Beginning*, Ἐτι τοίνυν ἀκριβέστερον ὁμολογησώμεθα, κ. τ. λ.

Ending, τότε οὐδαμῇ ἔστιν ἰστάναι.

Ib., lib. iv. c. xii.

4. *Beginning*, Ἐκ' αὐτὸ δὴ, ἦν δ' ἐγώ, εἰμι, κ. τ. λ.

Ending, τῷ ὄντι τωθαζόμενος δώσεις δίκην.

Ib., lib. v. c. xviii.

5. *Beginning*, Δεῖ δὴ, εἶπον, ἡμᾶς τοιόνδε νομίσαι περὶ αὐτῶν, κ. τ. λ.

Ending, τοῦτο διαμηχανήσασθαι.

Ib., lib. vii. c. iv.

MR. FERRAR.

Translate the following passage into Greek Verse:—

Beginning, What's he that wishes so?.....

Ending, That fears his fellowship to die with us.

SHAKESPEARE, *King Henry V.*, act iv. sc. iii.

Translate the following passage into Greek Prose:—

Beginning, If we would seize and comprehend the general outline of history,.....

Ending, or the nearest concerns of our own time.

SCHLEGEL, *Philosophy of History*.

Translate the following passage into Latin Lyric Verse:—

Beginning, The stars are with the voyager.....

Ending, The day is brighter day.

HOOD.

Translate the following passage into Latin Prose:—

Beginning, Such is steadfastly my opinion of the absolute necessity....

Ending, That point nothing else can or ought to determine.

BURKE, *On Conciliation with America*.

JUNIOR SOPHISTERS.

Mathematical Physics.

DR. SALMON.

1. How is an observatory clock set to the true sidereal time? If there were reason to believe that the right ascension of no star had yet been determined with sufficient accuracy, how should we proceed?
2. If we have the observatory clock set to the true sidereal time, how can we set another clock to ordinary mean solar time?
3. How is the time of the Moon's rising on a given day found? How does the problem differ from that of finding the time of rising of a star?
4. Given the mean anomaly of a planet, find the eccentric anomaly.
5. Find the centre of gravity of a shell whose bounding surfaces are nonconcentric spheres whose radii are a , b , the distance of the centres being D .
6. Find the principal parameter of the parabola described by a body projected along a smooth plane of given inclination, with a given velocity, and at a given elevation.

DR. SHAW.

7. The Sun was observed to pass the meridian at $11^h 59^m 18.7^s$ by chronometer, the equation of time being $+13^m 22.5^s$. Required the error of the chronometer both for apparent and for mean time.
8. Prove the following formulæ for the latitude (λ) and longitude (l) of a star S :

$$\sin \lambda = \frac{\sin(\phi - \omega) \sin \delta}{\sin \phi},$$

$$\tan l = \frac{\cos(\phi - \omega) \tan a}{\cos \phi},$$

$a = YD$, right ascension of star,

where $\phi = \angle SYD$,

$\omega =$ obliquity of ecliptic.

9. What are the principal quantities given in the Nautical Almanack?
10. A body falls from a given point towards a centre of force, the attraction at any distance r being $\frac{\mu}{r^2}$. To find the whole time of descent.

11. The centrifugal force of the Moon in her orbit is 0.00889 feet per second, while the centrifugal force of bodies at the Earth's equator is 0.11126 feet per second. Hence, and from the periodic time of the Moon, viz., 27 days, 7 hours, 45 minutes, calculate her mean distance from the Earth, in terms of the Earth's mean radius.

12. Determine the coefficient of friction between a rough body and an inclined plane, in terms of the angle of elevation, from observing that the least force that will suffice to move the body up the inclined plane is n times the least force that will sustain it on the plane.

MR. WILLIAMSON.

13. Explain the method of finding the latitude at sea from two altitudes of the Sun, and the time between. Determine the correction arising from the ship's change of place.

14. Prove that the equation of time caused by the obliquity of the ecliptic is a maximum, when the sum of the Sun's longitude and right ascension is 90° .

15. Find how much the time of a star's rising is altered by refraction.

16. A beam rests on a horizontal plane, and is prevented from slipping by a peg; find the least force which should be applied at a given point in order to upset it.

17. A bent lever, whose sides are inclined at a given angle, makes oscillations in its own plane about the angular point; find the length of the isochronous simple pendulum.

18. Find the least coefficient of friction which will enable a sphere to roll down a rough inclined plane without sliding.

Experimental Physics.

HEAT.

DR. APJOHN.

1. If the specific gravity of dry hydrogen at 60° , and under a pressure of 30, is 0.0691; what will it be at the same temperature and pressure when saturated with humidity? [N. B.—The force of vapour at 60° is assumed to be 0.5178.]

2. In Baume's hydrometer for liquids heavier than water, if N represents the number of the division cut on the stem of the instrument by a given liquid, how do you show that the specific gravity of the liquid will be $\frac{1}{144 - N}$?

3. To what specific gravity do 17° on Twiddle's hydrometer correspond?

4. Give the law of cooling as laid down by Newton, and deduce from it an expression for the velocity of cooling. State, also, the electrical question in the investigation of which this expression is employed.

5. What are the experiments, and what the method of calculation, employed by Lavoisier and Laplace in determining by the method of cooling the specific heat of the flask employed in their experiments?

6. Write the expression which gives the relation between c and c' , the specific heats of a gas under a constant pressure and a constant volume,

and mention its arithmetical value in the cases of air, oxygen, and hydrogen.

7. If 126 grains of the vapour of absolute alcohol, at its boiling point of 173° , be conducted into 1180 grains of water at 60° , what will be the temperature of the mixture, assuming that the specific heat of alcohol is 0.64, its latent heat 374° , and that no caloric is developed by chemical action?

8. If a cubic inch of water, weighing 252.46 grains at 60° , be converted into vapour of maximum density at same temperature, what will be its volume, the force of the vapour being 0.5178 of an inch of mercury?

9. A mass of air at 60° is heated so as to double its volume, and then reduced by sudden compression to its original bulk. What will its temperature become?

10. If 86 cubic inches of dry air at 60° , and under a pressure of 30, be heated to 120° , and, the pressure having fallen to 28, be then charged with vapour whose force is 2.9 inches of quicksilver, what will be its volume?

11. Give the expression which includes the theory of the wet-bulb hygrometer, and mention the hypothesis on which it has been investigated.

12. If in perfectly dry air, whose pressure is 30.35, $f = 0.35$, what is the depression of temperature shown by the wet thermometer?

13. A heated surface, kept at a constant temperature, applied to one extremity of a wooden tube, produces the same elevation of temperature at the other end, no matter what angle the surface makes with the axis of the tube. Deduce from this the law of the intensity of radiant heat emanating from the surface at different angles.

14. If two distant sources of heat whose temperatures are t and t' , when made to act separately on the ball of a thermometer, produce stationary temperatures exceeding that of the air by θ and θ' , then $\theta : \theta' :: t : t'$. Why is this the case?

ELECTRICITY.

MR. GALBRAITH.

1. Explain the mutual reaction of Richmann's plates, and deduce the expressions for the accumulations of electricity on the two surfaces.

2. In order to try the accumulating force of a condenser, I touch the collecting-plate with a proof-plane, and, on bringing it to Coulomb's balance, find a deflection of $60^{\circ}.5$; the other plate, treated in the same way, produces 60° . What number expresses the force?

3. How is the electric intensity expressed in terms of the angle of repulsion between the balls, if we take into account the oblique action of the repulsion on the force of torsion?

4. By what methods did Coulomb investigate the laws of electrical attractions and repulsions? Give the details of one experiment.

5. A small pith ball, in the neutral condition, is attracted towards an electrified body acting at a distance; explain the reason of this action, and prove that the force is proportional to the diameter of the ball, and inversely proportional to the cube of its distance.

6. What is the normal electric condition of the atmosphere? To what cause is this probably due? In what way did Biot ascertain this condition experimentally?

7. Demonstrate, on mathematical principles, the law of distribution of free electricity in ellipsoidal conductors.

8. If a single current is derived, determine the ratio of the intensity of the principal current to that of the primitive.

9. If a battery be formed of b rows of a cells in each row, prove that the intensity in the interpolar will be given by the equation

$$I = \frac{abE}{aR + br}.$$

10. How should thirty-six cells be arranged in order to obtain the greatest possible intensity in the interpolar, supposing the interpolar resistance to be equal to the resistance of one cell?

History and English Literature.

HISTORY.

PROFESSOR BARLOW.

1. The following question was argued before all the judges in the Exchequer Chamber in the reign of Charles I.:—"Whether the king had a right, on his own allegation of public danger, to require an inland county to furnish ships, or a prescribed sum of money by way of commutation, for the defence of the kingdom?" State the arguments on both sides.

2. Trace the progress of "privilege of parliament" under Henry VIII. and Elizabeth.

3. In the interval between the parliaments of 1614 and 1621, several events greatly aggravated the king's unpopularity. Give some account of them.

4. Mr. Hallam asserts that there are few circumstances in our history which have caused more perplexity to inquirers than the conduct of Cromwell and his friends towards the king in the year 1647—in what respect? Give some account of the adventures of Charles during the latter months of that year.

5. State the different theories of Selden and Madox as to the characteristics and attributes of baronial tenure.

6. What account does Mr. Knight give of the state of Scotland under James V.?

7. Who were the heirs female in remainder to the Crown, named in the will of Henry VIII. and the devise of Edward VI.?—and what descendants of the Queen of Scotland were passed over by both Henry and Edward?

8. What is the historical evidence for the common statement that 72,000 criminals were executed for theft and robbery in the reign of Henry VIII.?

9. Write a short account of the Lincolnshire insurrection in the same reign.

10. Relate the history of the Yorkists from the meeting of the parliament at Coventry till the proclamation of Edward IV.

11. Consider the effect of the death of Isabella of Castile on the political influence of Henry VII. on the Continent.

12. Give some account of the life and adventures of Henry, Earl of Richmond, before his accession to the English Crown.

ENGLISH LITERATURE.

PROFESSOR INGRAM.

1. Give an account of the dramatic writers commonly grouped together as the immediate predecessors of Shakspeare.

2. State all the facts you know, which can be used for the purpose of determining the chronological order of Shakspeare's plays.

3. Explain fully the following sentences from Shakspeare:—

a. "Woul't drink up Esil" [or, eisel] ?

b. "This quarry cries on havoc."

c. "When devils will the blackest sins *put on*,
They do *suggest* at first with heavenly shows."

d. "Even then this forked plague is fatal to us,
When we do quicken."

e. "I have rubbed this young quat almost to the sense,
And he grows angry."

f. "It is the cause, it is the cause, my soul,—
Let me not name it to you, ye chaste stars !—
It is the cause,—yet I'll not shed her blood."

g. "I would unstate myself, to be in a due resolution."

h. "This is some fellow
Who, having been prais'd for bluntness, doth affect
A saucy roughness, and *constrains the garb*
Quite from his nature.

i. "Nothing almost sees miracles
But misery."

j. "For this business,
It toucheth us as France invades our land,
Not bolds the king."

4. Explain the following expressions:—"The *sledded Polacks*;" "this *eternal blazon*;" "plighted cunning;" "wounds *untented*;" "this *enormous state*;" "this *unbolted villain*;" "ye *taking airs*;" "the *toged consuls*;" "sightless couriers;" "*thrice-driv'n bed of down*."

5. Write notes on the *metre* of the following lines:—

- a. "That croaks the fatal entrance of Duncan."
- b. "Tears in his eyes, distraction in his aspect."
- c. "Bounty, perseverance, mercy, lowliness."
- d. "That of an hour's age doth hiss the speaker."
- e. "My letters conjuring to that effect."

Classics.

SOPHOCLES.

MR. GRAY.

Translate the following passages into English:—

1. *Beginning*, XO. εἶην ὅθι δαίμων, κ. τ. λ.
Ending, μολεῖν γὰρ τᾷδε καὶ πολίταις.
Œdip. Col., 1044-1095.
2. *Beginning*, TE. γνώσει, τέχνης σημεῖα τῆς ἐμῆς κλύων, κ. τ. λ.
Ending, ἐμοὶ γὰρ οὗτος ἡγεμὼν, ἄλλοις δ' ἐγώ.
Antigone, 998-1014.
3. *Beginning*, δ μὲν χρόνος δὴ διὰ χρόνου προὔβαινέ μοι, κ. τ. λ.
Ending, οὐκ ἐνθάδ' οἱ πλοῖ τοῖσι σώφροσιν βροτῶν.
Philoctetes, 285-304.
4. *Beginning*, ΔΗ. τοιοῦτον ἐκβέβηκεν, οἶον, ἦν φράσω, κ. τ. λ.
Ending, κᾶδρων τοῖαῦτα.
Trachiniæ, 672-688.
5. *Beginning*, ΗΔ. ὦ φάος ἀγνὸν, κ. τ. λ.
Ending, αἰκῶς οἰκτρῶς τε θανόντος.
Electra, 86-102.

1. Sophocles effected a thorough change of the whole essence and organization of tragedy? These changes are prominently shown in his *Electra*, compared with the *Orestea* of Æschylus?

2. Point out the particular situations which form the turning points of the different plays, and the ethical ideas which are asserted in them.

3. What is meant by the "irony" of Sophocles?

4. Sophocles has been obliged for once to avail himself of the "*Deus ex machinâ*"?

5. Give an account of the revolt of Samos from the Athenians in B. C. 440.

6. Grote points out some circumstances respecting this revolt, as illustrating the existing condition of the Athenian empire?

7. Mention the principal operations in which the Athenians were engaged from B. C. 477-463.

LATIN SATIRISTS.

MR. FERRAR.

Translate the following Passages into English Prose :—

1. *Beginning*, Hospite venturo, cessabit nemo tuorum.
Ending, Quam primum prædam rupto gustaverat ovo.
JUVENAL, *Sat.* xiv. 59-85.
2. *Beginning*, Sæpe oculos, memini, tangebam parvus olivo, ...
Ending, Mænaque quod prima nondum defecerit orca.
PERSIUS, *Sat.* iii. 44-76.
3. *Beginning*, Stemmata quid faciunt? quid prodest, Pontice, longo.
Ending, Atria, nobilitas sola est atque unica virtus.
JUVENAL, *Sat.* viii. 1-20.
4. *Beginning*, Vix tamen eripiam, posito pavone, velis quin.
Ending, Jejunos raro stomachus vulgaria temnit.
HORACE, *Sat.* lib. ii. sat. ii. 23-38.

1. What is Merivale's account of Caius' journey to the Rhine?
2. What were the chief measures of Claudius?
3. Trace the descent of Messalina from Marcus Antonius, the Triumvir.
4. Write a note on the influence of the Jews in the early times of the Empire.
5. What is the order of the words in a Latin Proposition?
6. What is the construction of the words, *fido*, *invideo*, *occumbo*, *opus*, *liber*, and *alienus*?
7. Who were the Quæstores Classici, and when were they first appointed?
8. Two different alphabets reached Italy.
9. What are the roots of the words, *socius*, *sacer*, *lucus*, *nidus*, *cor*, *prex*, *conseo*, *Castor*, *cæcus*, and *Cocles*?

MR. ABBOTT.

Translate the following passage into Greek Prose :—

Beginning, I never met with a consideration that is more finely spun, . . .
Ending, but thou art no longer the person whom he reproaches.

SPECTATOR, No. 355.

Translate the following passage into Greek Verse :—

Beginning, Vol. Should we be silent, and not speak, our raiment, ...
Ending, Our comfort in the country.

SHAKESPEARE, *Coriolanus*, act v. sc. iii.

Translate the following passage into Latin Prose :—

Beginning, It had been hard for him that spake it

Ending, without which the world is but a wilderness.

BACON, *Essays—Of Friendship*.

Translate the following passage into Latin Lyric Verse :—

Beginning, Where awful summits rise around, ...

Ending, In the soft dreams of poesy.

HEMANS, *The Minstrel Bard*.

SENIOR FRESHMEN.

Mathematics.

DR. SALMON.

1. Find what relation must be satisfied by the coefficients of the general equation of the second degree, if one of the asymptotes passes through the origin.

2. Prove that the condition that the right line $\lambda\alpha + \mu\beta + \nu\gamma$ should touch $\sqrt{l\alpha} + \sqrt{m\beta} + \sqrt{n\gamma}$ is

$$\frac{l}{\lambda} + \frac{m}{\mu} + \frac{n}{\nu} = 0;$$

and reciprocally the condition that it should touch

$$\frac{l}{\alpha} + \frac{m}{\beta} + \frac{n}{\gamma}$$

is $\sqrt{l\alpha} + \sqrt{m\beta} + \sqrt{n\gamma} = 0$.

3. If tangents to two circles make with each other a constant angle, find the locus of their intersection.

4. In a spherical triangle, prove that

$$\frac{\tan \frac{1}{2}a - \tan \frac{1}{2}b \cos C - \tan \frac{1}{2}c \cos B}{\tan \frac{1}{2}b - \tan \frac{1}{2}a \cos C - \tan \frac{1}{2}c \cos A} = \frac{\cos(B - C)}{\cos(A - C)}.$$

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5. Prove that

$$\sin b \sin c + \cos b \cos c \cos A = \sin B \sin C - \cos B \cos C \cos a.$$

6. It is required to find the locus of the intersection of two variable tangents to a conic, which intercept on a fixed tangent a portion which subtends a constant angle at one of the foci. Solve this problem by reciprocation.

DR. SHAW.

7. Given one focus of an ellipse, a tangent, and its point of contact, and the radius of curvature at the point; construct the axis major.

8. Two constant angles turn round two fixed points; a side of one constantly intersects a side of the other on a fixed right line. Show that the remaining two sides intersect on a conic passing through the two fixed points.

9. Show that the solution of

$$x^4 + px^3 + qx^2 + rx + s = 0$$

can be reduced to that of quadratics

$$\begin{aligned} \text{(i.) if } p^3 - 4pq + 8r &= 0, \\ \text{or (ii.) if } p^2s - 4qs + r^2 &= 0. \end{aligned}$$

10. Prove geometrically that

$$\cot \theta + \operatorname{cosec} \theta = \cot \frac{1}{2}\theta;$$

and hence sum the series

$$\operatorname{cosec} \theta + \operatorname{cosec} 2\theta + \operatorname{cosec} 4\theta + \&c. \text{ to } n \text{ terms.}$$

11. Show that of all the triangles which stand on $2c$ as base, and have their vertices on a given right line, that which has the least perimeter has for its area

$$\frac{c \cos \theta}{P} (P^2 - c^2 \sin^2 \theta);$$

where P is the perpendicular let fall from the middle point of $2c$ on the given right line, and θ is the angle between this line and the base.

12. A draws a ball four times from a bag containing two white and eight black balls, replacing each time the ball he has drawn; find the chance that he will have drawn (i.) two white and two black; (ii.) not less than two white.

MR. WILLIAMSON.

13. The locus of the centres of equilateral hyperbolæ, circumscribing a given triangle, is the circle which passes through the middle points of its sides?

14. Given three points and a focus of a conic; determine its centre by a geometrical construction.

15. Without assuming the expression for the radius of curvature of an ellipse, prove that the length of the chord of the osculating circle which passes through the centre is $\frac{2b^2}{a}$.

16. Given two sides of a spherical triangle, find when its area is a maximum; and show how to construct the triangle in that case.

17. Given one base angle of a right-angled spherical triangle, prove that the difference of the sides which contain it is a maximum, when their sum is equal to a quadrant.

18. Solve the equations

$$\begin{aligned}x + y + z &= h, \\ax + \beta y + \gamma z &= h^2, \\a^2x + \beta^2y + \gamma^2z &= h^3.\end{aligned}$$

DR. SALMON.

1. Find the radius of curvature at any point of a parabola.

2. Find the equation of the pair of lines joining to the origin the intersection of the line $lx + my + n$, with the conic given by the general equation.

3. Given two tangents and two points on a conic, what is the envelope of the chord of contact of the conic with the two tangents?

4. Eliminate θ from the equations

$$a \cos \theta + b \sin \theta = c, \quad a' \cos \theta + b' \sin \theta = c'.$$

5. One of the roots of the cubic

$$x^3 - px^2 + qx - r = 0$$

is double another; reduce the finding it to a quadratic equation.

6. In a spherical triangle, if three lines through the vertices meet in a point, three lines equally inclined to the sides will also meet in a point?

DR. SHAW.

7. From any point P let fall a perpendicular PN on its polar with respect to an ellipse, and produce PN to meet the axis major in N' . Prove

$$PN' \cdot NN' = \frac{b^2}{a^2} (a^2 - e^2 x'^2);$$

and hence deduce an expression for the normal in terms of the diameter parallel to the tangent.

8. Find the locus of intersections of tangents which cut at right angles, the curve being a parabola.

9. In a plane triangle, if the angles and sides receive small variations, prove that

$$\begin{aligned}c\delta B + b \cos A \delta C &= 0, & a, b \text{ being constant.} \\ \cos C \delta b + \cos B \delta c &= 0, & a, A \text{ being constant.} \\ \delta b \tan A &= b \delta C, & a, B \text{ being constant.}\end{aligned}$$

10. On the sides of a triangle a, b, c as diameters, three circles are described, intersecting in P, Q, R . Show that the perimeter of the triangle PQR = that of $abc \times 4 \sin \frac{1}{2}A \sin \frac{1}{2}B \sin \frac{1}{2}C$.

11. Find the roots of the equation

$$x^3 - 3x^2 + 4 = 0.$$

12. A general orders two men by lot out of 100 mutineers to be shot : the real leaders of the mutiny being ten, find the chance (i.) that one or (ii.) that two of them will be taken.

MR. WILLIAMSON.

13. Given three tangents and a focus of a conic, find its centre by a geometrical construction.

14. Given two conjugate diameters of a conic in magnitude and position, determine its axes geometrically.

15. If a, b, c, d be the roots of the biquadratic

$$x^4 + px^3 + qx^2 + rx + s = 0,$$

find the value of $\Sigma (a+b)(c+d)$.

16. If α, β, γ be the roots of a cubic, find the value of

$$\frac{\alpha^2 + \beta^2}{\alpha + \beta} + \frac{\alpha^2 + \gamma^2}{\alpha + \gamma} + \frac{\beta^2 + \gamma^2}{\beta + \gamma}$$

in terms of its coefficients.

17. Prove that $\theta = \frac{2}{3}\pi$ is a solution of the equation

$$\sin \theta - \cos \theta - 4 \sin \theta \cos^2 \theta = 0.$$

18. Find the condition that the line $lx + my + n = 0$ should touch a conic given by its general equation.

Logics.

STEWART.

MR. POOLE.

1. Stewart points out a circumstance which might seem an objection to education ; state this, and show that it is not really so.

2. How does he show that a knowledge of the existence of the material world is not required in order to the exercise of the faculties of the mind ?

3. Stewart argues against a distinction made by Reid between perception and imagination ; how does he reason ? He accounts for the appearance of truth in Reid's opinion ; and quotes from Reid's views elsewhere in opposition to his opinion ?

4. State the views of Plato and Aristotle as to what is expressed by a generic term ; and how they differ, according to Stewart, on the subject of ideas.

5. To what circumstances does Stewart trace the origin of the opinion of Plato as to the true method of scientific inquiry?

6. Whence does the pleasure derived from wit chiefly arise?—and state the facts which prove this.

7. Give an accurate statement of Stewart's arguments to prove that the phenomena of dreaming arise from the suspension of that power of the will over the faculties of the mind and members of the body which it possesses when men are awake.

8. State the various ways in which the knowledge of the philosopher is more extensive than that of other men; and the different advantages to him of a hypothetical theory, and of one founded on induction.

MURRAY.—LOCKE.—BACON.

DR. DICKSON.

1. If the new premisses be legitimate after substituting the conclusion for the minor premiss, investigate the mode and figure.

2. Reduce *Darii* to *Celarent*.

3. Given three propositions which form a syllogism, construct it; and show that only one legitimate syllogism can be formed of them.

4. What inconsistency is involved in Locke's speaking of building morals into a demonstrative science?

5. Give the substance of Locke's proof that Relations terminate in simple ideas.

6. How does Locke's account of perception differ from Stewart's?

7. How does Bacon divide *Artes Logicae*? What are the grounds of his division?

8. What example does Bacon give of *compulsio experimenti*, and why does he consider the method valuable?

9. What method of those enumerated by Bacon was employed by Archimides to detect the fraud committed respecting Hiero's crown?

10. Enumerate and explain the several kinds of Idola?

Classics.

THUCYDIDES.

MR. FERRAR.

Translate the following passages into English Prose :—

1. *Beginning*, Οἱ δὲ Ἀθηναῖοι ἐν τῇ Σηστῷ δυοῖν δεύουσας, κ. τ. λ.

Ending, ὥς οὐ προσεχώρει, ἀπέπλευσαν εἰς Ἀβυδὸν.

Lib. viii. c. 102.

2. *Beginning*, Ἐγὼ μὲν οὖν ὁ αὐτός εἰμι τῇ γνώμῃ, κ. τ. λ.
Ending, ἀπὸ τῶν λόγῳ καλῶς ἐπιτιμησάντων
 Lib. iii. c. 38.
3. *Beginning*, Αὐτόθεν δὲ διανοήθητε ἡ ὑπακούειν πρὶν τι βλαβῆναι,
 κ. τ. λ.
Ending, προσέτι καὶ θαλάσσης εἰργόμενοι
 Lib. i. c. 141.
4. *Beginning*, Ἀπιστα μὲν ἴσως, ὥσπερ καὶ ἄλλοι τινές, κ. τ. λ.
Ending, μήτε ἀπιστήσαντες τοῦ ξύμπαντος ἀμελήσειτε.
 Lib. vi. c. 33.

1. What materials had Thucydides for the composition of his History?
2. Show that he had only a partial view of what should be embraced in a History of Greece.
3. Discuss the question of the genuineness of his *eighth* book.
4. When and with what success was Petalism tried at Syracuse?
5. What were the two chief objects of the Hermokopidæ?
6. How does Thucydides treat the siege of Melos, and with what object?
7. Draw a map of Syracuse and of the Athenian lines during the siege.
8. What were the chief events of the year 424 B. C.?
9. When and where was Mindarus slain?
10. In what capacity did Lysander gain the battle of Ægos Potami?
11. What changes were effected in the Athenian constitution in 411 B. C.
12. How may the irregular constructions that occur in Greek be accounted for?
13. Show clearly, by examples, what are meant by primary, secondary, and tertiary predicates.
14. What were the three great centres of Art in Greece, and what were the characteristics of each?
15. Explain the formation of the words, πᾶς, ἕκαστος, ὅπως, μέλαινα, and ἔχιδνα.
16. What changes does the Digamma undergo in Greek?
17. There is only one certain example of an original *gh* becoming *θ* in Greek?
18. What are the derivations of the words, Δάφνη, Ἀπία, and Δελφοί?

TACITUS.

MR. ABBOTT.

Translate the following passages into English Prose :—

1. *Beginning*, Multa sine dubio sævaque Augustus de moribus.....
Ending, ut non aliter ratio constet quam si uni reddatur.
Ann. lib. i. c. 6.
2. *Beginning*, Tum Cn. Pompeius tertium consul,.....
Ending, legis nexus modicum in præsens levamentum fuere.
Ann. lib. iii. c. 28.
3. *Beginning*, Festis Saturno diebus inter alia æqualium ludicra.....
Ending, sive temperamentum inerat ne statim sæviret.
Ann. lib. xiii. c. 15.
4. *Beginning*, Haudquaquam erecto animo eas voces accipiebat,.....
Ending, Sabinus non insultans et miseranti propior.
Hist. lib. iii. c. 65.

1. Enumerate the principal tribes mentioned by Tacitus as inhabiting Britain; stating also where their settlements were situated.
2. What were the boundaries of Germany, as conceived by Tacitus?
3. Give some account of the achievements of Arminius.
4. State the most important provisions of the following laws:— Lex Papia Poppæa, Cincia Muneralis, Juliæ Sumtuarie.
5. What were the first measures of Caligula?
6. Give some account of Vespasian up to the time of his accession to the empire?
7. What were the last words of Nero?
8. Explain the formation of such futures as, *πλευσονται*, and the Doric in *σιω*.
9. What was the original form of the genitive termination *ου* of the 2nd declension?
10. What was the cause of the frequent occurrence of hiatus in Greek?
11. What are the peculiarities of Greek and Latin with respect to their consonant systems?
12. What are the Latin affinities of *τέφρα*, *σφόγγος*, *σφενδόνη*, *βόρακος*, *ἵκτομαι*, *ἰός*?

MR. GRAY.

Translate the following passage into Latin Prose:—

- Beginning*, But with the fortunes of Augustus,.....
Ending, as it had already been the cause of his temporary disgrace.
 MERIVALE, *History of the Romans under the Empire*, c. xlii.

Translate the following passage into Latin Lyric Verse :—

Beginning, When the British warrior queen, ...

Ending, Shall a wider world command."

COWPER, *Boadicea*.

Translate the following passage into Greek Prose :—

Beginning, The same Homer who pleased at Athens and Rome

Ending, they maintain their authority over the minds of men.

HUME.

Translate the following passage into Greek Iambic Verse .—

Beginning, Your coming, friends, revives me ; for I learn, ...

Ending, These two, proportioned ill, drove me transverse.

MILTON, *Samson Agonistes*.

JUNIOR FRESHMEN.

Mathematics.

A.

GEOMETRY.

MR. TOWNSEND.

1. Given three points or rays of an harmonic system, determine the fourth without the aid of a circle.
2. Given two arcs of a circle, determine the arc that cuts both harmonically without the aid of a second circle.
3. Given two circles in magnitude and position, place a third circle of given magnitude so as to cut both orthogonally.
4. Given a segment or angle in magnitude and position, place a second segment or angle of given magnitude so as to cut it in a given anharmonic ratio.
5. If two of six lines intersect the remaining four equianharmonically, every two of the six intersect the remaining four equianharmonically?
6. If six lines pass three and three through four points, the six perpendiculars upon them from any fifth point determine a pencil of six rays in involution?

DR. SHAW.

7. Show geometrically that the harmonic mean between two lines equals (i.) the rectangle under them, divided by half their sum, and also (ii.) the rectangle under the differences divided by half the difference of these differences.

8. The sides of one triangle ABC pass through the vertices a, b, c of another; show that if the lines Aa, Bb, Cc intersect at a point, and the sides of each triangle be produced to meet the opposite sides of the other, every line in the figure is cut harmonically.

9. Given two points in the circumference of a circle and a chord, to find a third point such that the chords joining it to the given points may intercept on the given chords two segments in a given ratio.

10. From a point in the diameter of a circle produced, to draw a chord cutting the circle so that the rectangle under the lines joining the points of section to the extremities of the diameter may be given.

11. A quadrilateral circumscribes a circle, and the points of contact are joined so as to form an inscribed quadrilateral; show that the diagonals of the two quadrilaterals all intersect in the same point and form a harmonic pencil.

12. Describe a circle passing through a given point, and cutting two given right lines, so that the intercepted chords may subtend given angles at the centre.

MR. WILLIAMSON.

13. If from any point on one circle tangents be drawn to another, find the envelope of the chord joining the points of their intersection with the first circle.

14. Given all the sides of a polygon, prove that its area is a maximum when it is capable of being inscribed in a circle.

15. Divide a given circle into five equal parts geometrically, by describing concentric circles.

16. If the bisectors of the base angles of a triangle be equal, prove that it is isosceles.

17. Describe a circle which shall touch two given circles, and intersect a third at a given angle.

18. Given of a triangle its inscribed circle, and the difference of its sides, find the locus of its vertex.

B.

ALGEBRA.

MR. TOWNSEND.

1. Clear of radicals the equation

$$\sqrt{a} + \sqrt{b} + \sqrt{c} + \sqrt{d} = 0.$$

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2. Find the values of x which satisfy the equation

$$\sqrt{x^2 + ax - 1} + \sqrt{x^2 + bx - 1} = \sqrt{a} + \sqrt{b}.$$

3. Find the values of x and y which satisfy the equations

$$\sqrt{x+y} + \sqrt{x-y} = \sqrt{a}, \quad \sqrt{x^2 + y^2} + \sqrt{x^2 - y^2} = \sqrt{b^2}.$$

4. Find by any method the sum to infinity of the series

$$1 + 2x + 3x^2 + 4x^3 + \&c.$$

5. State and prove the rule for reducing a mixed circulating decimal to its equivalent ordinary fraction in any scale of notation.

DR. SHAW.

6. A waterman rows a given distance a , and back again in $\frac{1}{h}$ hours, and finds that he rows b miles with the tide for b' against it. Required the rate of the tide, and the rate of rowing; also the times of rowing down and up the stream.

7. If σ be the sum, and σ_2 the sum of the squares of the terms of an infinite geometrical progression, then will

$$a = \frac{2\sigma\sigma_2}{\sigma^2 + \sigma_2}, \quad r = \frac{\sigma^2 - \sigma_2}{\sigma^2 + \sigma_2}.$$

8. Prove that the coefficient of x^r in

$$(1 + 2x + 3x^2 + \&c. \text{ ad inf.})^2$$

$$\text{is } \frac{1}{2}(r+1)(r+2)(r+3).$$

9. Let $a^x = b^y = c^z$; show that if x, y, z be in harmonic progression, then a, b , and c will be in geometrical.

10. In a bag are 10 balls, of which I draw 4; find the chance that there shall be among them—

(i.) 2 marked ones.

(ii.) 3 only out of 5 marked ones.

MR. WILLIAMSON.

11. Solve the equation

$$(x^3 + 3ax)^{\frac{1}{2}} - (x^3 - 3ax)^{\frac{1}{2}} = \frac{2a^{\frac{1}{2}} x^{\frac{1}{2}}}{b^{\frac{1}{2}}}.$$

12. Show that the sum of the series

$$2 + 6 + 14 + 30 + \&c.$$

to n terms is $2^{n+2} - (2n + 4)$.

13. Decompose into its partial fractions the expression

$$\frac{x^2 + 3x - 4}{(x+2)^2(x-3)}.$$

14. Reduce to its simplest form the quantity

$$\frac{1 + \sqrt{-1}}{1 - \sqrt{-1}} \times \frac{5 - \sqrt{-2}}{1 + \sqrt{-2}}.$$

15. Solve the simultaneous equations

$$x^2 + xy + y^2 = 84,$$

$$x + \sqrt{xy + y} = 14.$$

C.

TRIGONOMETRY.

MR. TOWNSEND.

1. Prove the formula for the tangent of the sum of any number of angles in terms of the tangents of the several angles.

2. Given that $\tan(\alpha + \beta\sqrt{-1}) = a + b\sqrt{-1}$, required the values of a and b in terms of α and β , and conversely.

3. Given that $x = a \cos(\phi + \alpha)$, $y = b \cos(\phi + \beta)$, $z = c \cos(\phi + \gamma)$, prove that

$$\frac{x}{a} \cdot \sin(\beta - \gamma) + \frac{y}{b} \cdot \sin(\gamma - \alpha) + \frac{z}{c} \cdot \sin(\alpha - \beta) = 0.$$

4. If x be any finite angle, and δ any small change in it positive or negative, prove that approximately

$$\log_e \sin(x + \delta) = \log_e \sin x + \cot x \cdot \delta,$$

$$\log_e \cos(x + \delta) = \log_e \cos x - \tan x \cdot \delta.$$

5. Prove the logarithmic formulæ for the base and base angles of a plane triangle, in terms of the sides and the vertical angle.

DR. SHAW.

6. By means of the formula

$$\sin \alpha = \alpha - \frac{\alpha^3}{1 \cdot 2 \cdot 3} + \&c.$$

calculate the numerical value of $\sin 1^\circ 54' 35''.5$ to five places of decimals.

7. Prove geometrically that

$$\cot \frac{\theta}{2} - \tan \frac{\theta}{2} = 2 \cot \theta.$$

8. Assuming the preceding formula, prove that the sum of the series

$$\frac{1}{2} \tan \frac{\theta}{2} + \frac{1}{4} \tan \frac{\theta}{4} + \frac{1}{8} \tan \frac{\theta}{8} + \&c.$$

to n terms is

$$\frac{1}{2^n} \cot \frac{\theta}{2^n} - \cot \theta.$$

9. If the tangents of the angles of a triangle are in geometric progression, so that

$$\tan A = r \tan B = r^2 \tan C,$$

show that (i.)

$$\tan C = \left\{ \frac{1 + r + r^2}{r^3} \right\}^{\frac{1}{2}},$$

and that (ii.)

$$\sin 2C = r \sin 2A.$$

10. Looking at two distant towers, their summits seem in the same straight line from my eye. On approaching C yards towards them, the angle of elevation of the nearer becomes twice that of the more remote. Show that the distance of the towers from me being, respectively, a and b yards, their heights are

$$h' = \left\{ \frac{(b-c)(2bc-ab-ac)}{a} \right\}^{\frac{1}{2}},$$

$$h = \left\{ \frac{(b-c)(2bc-ab-ac)}{b} \right\}^{\frac{1}{2}}.$$

MR. WILLIAMSON.

11. If $\tan A = \frac{1}{3}$, and $\tan B = \frac{1}{4}$, find the value of $\tan(3A + B)$.

12. Eliminate θ between the equations

$$a \cos(\theta + \alpha) = x \text{ and } b \cos(\theta + \beta) = y.$$

13. Prove Machin's formula, viz.,

$$\frac{\pi}{4} = 4 \tan^{-1} \frac{1}{5} - \tan^{-1} \frac{1}{239}.$$

14. Apply this formula to the calculation of π to five places of decimals, assuming the expansion for θ in terms of $\tan \theta$.

15. Find the sum of the infinite series,

$$1 + a \sin \theta + \frac{a^2}{1.2} \sin 2\theta + \frac{a^3}{1.2.3} \sin 3\theta + \&c.$$

a being less than unity.

D.

GEOMETRY.

MR. TOWNSEND.

1. If two circles intersect at right angles, the polar of either centre of similitude with respect to either circle is the polar of the other centre of similitude with respect to the other circle?

2. If a variable circle intersect two fixed circles, its chord of contact with both is cut in a constant anharmonic ratio by their radical axis and by their centre of similitude through which it passes?

3. If three of the six tangents to a circle from the three vertices of a triangle, meet the three opposite sides of the latter in three collinear points, the remaining three meet them also in three collinear points?

4. Apply the method of homographic division to the solution of the problem: "to draw a chord of a given angle which shall be cut in two given anharmonic ratios by two other given angles."

DR. SHAW.

5. If three coaxial circles touch the three sides of a triangle and three more of the same coaxial system pass through the three vertices, the six centres are in involution?

6. Describe a circle of a given coaxal system cutting a given circular arc in a given anharmonic ratio.

7. If two intersecting circles be inverted from any point, the inverse circles intersect at the same angles as the originals. Prove this, and show from it that every two intersecting circles and their two circles of inversion invert from any point into two circles and *their* two circles of inversion.

8. A triangle of given species is inscribed in a fixed triangle and a circle is inscribed in the variable triangle, find the locus of its centre.

MR. WILLIAMSON.

9. Tangents to two circles intersect at a given angle; find the locus of the point dividing in a given ratio the line joining the points of contact.

10. Construct an isosceles triangle, being given the perpendiculars on its sides from the centre of its circumscribing circle.

11. Describe a circle coaxal with two given circles, and cutting off a given arc from a third.

12. If a circle touch two fixed circles, it divides every coaxal circle homographically?

Classics.

MR. ABBOTT.

Translate the following passages into English :—

1. *Beginning*, Θῆβαι δὲ, Θῆβαι, πόλις ἀστυγείτων, κ. τ. λ.

Ending, ἀλλ' ἤδη περὶ τοῦ τῆς πατρίδος ἐδάφους.

ÆSCHINES, *Contra Ctesiphontem*, s. 116.

2. *Beginning*, Καίτοι πόσα χρήματα τοὺς ἡγεμόνας τῶν συμμοριῶν, κ. τ. λ.

Ending, τὸν τ' ἐκ τοῦ προτέρου νόμου καὶ τὸν κατὰ τὸν ἐμόν. Λέγε.

DEMOSTHENES, *De Corona*, s. 81.

3. *Beginning*, Δεῖν δ' ὤφετο μηδένα ἀποστερεῖσθαι τοῦ δίκης τυχεῖν, κ. τ. λ.

Ending, ἴν' ἐκινδύνευες περὶ χιλίων, γέλως ἂν εἴη δῆπουθεν.

DEMOSTHENES, *Adv. Androt.*, s. 26.

4. *Beginning*, Λαβὲ δὴ καὶ τὸν μεταλλικὸν νόμον, κ. τ. λ.

Ending, ἃ προεῖντό σοι, μεθ' ὅπλων ἤκειν νομίζεις.

DEMOSTHENES, *Adv. Pantæn*, ss. 35, 36.

1. What adjectives are regularly placed before the article and substantive, or after them?

2. How are relations of time expressed by the three cases, respectively?
3. What is the true account of the accusatives said to depend on *κατα* understood?
4. Why is it generally erroneous to suppose cases to depend on prepositions understood?
5. Explain what is meant by the subjective, objective, passive, and material genitives.
6. State accurately the nature of the relation between the Greek and Latin languages, and of both to Sanscrit.
7. When either language is said to be older than the other, what is the meaning of the expression?
8. Give some account of the life of Iphicrates.
9. Explain the nature and object of Ostracism, according to Grote.
10. Why was Delos chosen as the centre of the Athenian Confederacy?
11. The proceedings of Pisistratus with respect to Delos illustrate its importance?
12. Give an account of the history of Polycrates, his views and measures.

CICERO.

MR. GRAY.

Translate the following passages into English :—

1. *Beginning*, Esto: ipse nihil eat, nihil potest.
Ending, ut tibi hospes aliquis sit recipiendus.
In Q. Cæcilium Divinatio, c. 15.
2. *Beginning*, At ut videatur tamen res agi et non eripi pupillo:
Ending, angustiis temporis excluduntur omnes.
In Verrem, Act. II. lib. i. c. 56.
3. *Beginning*, Primo mirantur omnes improbitatem calumniæ:
Ending, ab jure omnium Siculorum ne recedatur.
Ibid., Act II. lib. ii. c. 15.
4. *Beginning*, In scriptura Siciliæ pro magistro est quidam
Ending, litteris dicere in istum et proferre possemus.
Ibid., Act II. lib. ii. c. 70.

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1. Explain the following :—

“Cognitor, præjudicium, quadruplatores, intus canere, peculium, compromissum, testamentum inofficiosum, demortuus, hereditas commissa, præ litis et vindiciarum.”

2. Trace the origin of the “Quæstio perpetua de pecuniis repetundis;” and describe the form of procedure.
3. Explain the phrases, “perpetuum edictum” and “edictum translatitium.”

4. Cæsar's policy was essentially different from that of his predecessors in provincial administration ?

5. What explanation has been given of the apparent pusillanimity of Pompey in abandoning Italy ?

6. Cæsar's imperial authority was a combination of the prerogatives of several republican offices ; in what way did they severally contribute to his power ?

7. Mention, in their order, the principal military events from the crossing of the Rubicon to Cæsar's last battle.

8. Draw a map of Sicily, marking the principal towns on the coast, and giving, where you can, the modern names.

9. Describe the condition of Sicily, as a Roman province, in the time of Cicero.

10. State the general rules, and the principle on which they depend, for the use of the different tenses of the subjunctive mood in conditional propositions, and in expressing a wish.

11. Reduce the following sentence to the "oratio obliqua :"—

"Quid hoc rei est, inquit, tribuni? Ap. Herdonii ductu rempublicam eversuri estis? Tam felix vobis corrumpendis fuit, qui servitia vestra non commovit auctor? Quum hostes supra caput sint discedi ab armis legesque ferri placet?"

12. Conjugate the following: "torreo, torqueo, strepo, tero, verro fodio, sarcio, ordior."

MR. FERRAR.

Translate the following passage into Greek Verse:—

Beginning, I know you all, and will awhile uphold.

Ending, Redeeming time when men think least I will.

SHAKSPEARE.

Translate the following passage into Greek Prose:—

Beginning, Let none of you, O Athenians, imagine that I am here.

Ending, her really sure and effectual means of protecting the Chersonese.

Transl. of Demosthenes.

Translate the following passage into Latin Verse:—

Beginning, You ask me, why, tho' ill at ease, ...

Ending, Hath time and space to work and spread.

TENNYSON.

Translate the following passage into Latin Prose:—

Beginning, The sum of the whole is plainly this.

Ending, are equally so to both by the same actions.

BUTLER, *Sermon I.*

FELLOWSHIP EXAMINATION.

Examiners.

HUMPHREY LLOYD, D. D., Vice-Provost.

JAMES HENTHORN TODD, D. D., Regius Professor of Hebrew.

ANDREW SEARLE HART, LL. D.

JOHN TOLMEY, M. D.

CHARLES GRAVES, D. D.

THOMAS STACK, M. A., Regius Professor of Greek.

JOHN H. JELLETT, M. A., Professor of Natural Philosophy.

MICHAEL ROBERTS, M. A., Professor of Mathematics.

Mathematics, Pure and Applied.

DR. HART.

1. Integrate the equation,

$$x \frac{dy}{dx} - 3y + ay^2 = cx^2.$$

2. Integrate

$$\frac{d^2y}{dx^2} + (4x + a) \frac{dy}{dx} + (x^4 + ax^2 + 2x)y = 0.$$

3. Integrate

$$(1 - x^2) \frac{d^2y}{dx^2} + \left(\frac{n+1}{x} + (n-9)x \right) \frac{dy}{dx} + 4(n-4)y = 0.$$

4. Investigate the form of
- V
- , that
- $\iint V dy dx$
- may be capable of a first integration;
- V
- being a function of
- x, y, z, p, q, r, s, t
- .

5. Find the general equation of the surface which contains a maximum volume within a given area; and show that if it be a closed surface of revolution it must be a sphere.

6. If this surface is bounded by given curves, how are the tangent planes along these bounding curves determined?

7. Prove that every multiple point on a curve is also a multiple point on its Hessian, and find its order.

8. If several curves of the same degree intersect in the same points, prove that a double point on one of them has the same polar with respect to all the others.

9. Find the equation of three right lines which pass through the points of inflexion of the curve

$$ax^3 + by^3 + cz^3 + 6dxyz = 0.$$

10. Show how to compute the coefficients of the corresponding equation, when the curve is represented by the general equation of the third degree.

PROFESSOR ROBERTS.

1. Prove that all homogeneous binary forms of the fifth degree can be reduced by linear transformations to the form

$$ax^5 + by^5 + cx^5,$$

when $x + y + z = 0$.

2. Express the cubic invariant of the form

$$(b^2 - ac)x^4 + 2(ad - bc)x^3y + (ae + 2bd - 3c^2)x^2y^2 + 2(be - cd)xy^3 + (ce - d^2)y^4,$$

as a function of the invariants of the form

$$ax^4 + 4bxy^3 + 6cx^2y^2 + 4dxy^3 + ey^4.$$

3. If α, β, γ are the roots,

$$ax^3 + 3bx^2 + 3cx + d = 0,$$

find the equation whose roots are

$$\frac{2\alpha - \beta - \gamma}{\gamma(\alpha - \beta) + \beta(\alpha - \gamma)}, \quad \frac{2\beta - \alpha - \gamma}{\alpha(\beta - \gamma) + \gamma(\beta - \alpha)}, \quad \frac{2\gamma - \alpha - \beta}{\alpha(\gamma - \beta) + \beta(\gamma - \alpha)}.$$

4. Deduce from the properties of the Eulerian integrals the following relations :

$$\int_0^1 x^{m-1} (1-x^n)^{\frac{m-n}{n}} dx = 2^{1-\frac{2m}{n}} \int_0^1 \frac{x^{m-1} dx}{\sqrt{1-x^n}},$$

$$\int_0^1 x^{n-2p-1} (1-x^n)^{\frac{p-n}{n}} dx = 2^{-\frac{2p}{n}} \int_0^\infty \frac{z^{p-1} dz}{\sqrt{1+z^n}}.$$

5. Express by circular functions the ratio of the following definite integrals :

$$\int_0^1 \frac{x^{m-1} dx}{\sqrt{1-x^n}}, \quad \int_0^\infty \frac{z^{m-1} dz}{\sqrt{1+z^n}}.$$

6. Prove that

$$(\Gamma \frac{1}{2})^3 = 2^{\frac{4}{3}} 3^{\frac{1}{3}} \pi F(\cos 15^\circ \theta_1),$$

$$\text{when } \cos \theta_1 = \frac{\sqrt{3-1}}{\sqrt{3+1}}.$$

1. If the general equation of the second degree,

$$ax^2 + by^2 + cz^2 + 2lyz + 2mzx + 2nxy + 2px + 2qy + 2rz + d = 0,$$

represents an hyperboloid, the origin being situated on the asymptotic cone; find the relation existing among the coefficients, and determine in this case the value of the discriminant.

2. If the centre of the surface,

$$A'(x-\alpha)^2 + B'(y-\beta)^2 + C'(z-\gamma)^2 = 1,$$

which is inscribed in a self-conjugate tetrahedron with respect to

$$Ax^2 + By^2 + Cz^2 = 1,$$

lie on this latter surface; find the relation between A, B, C, A', B', C' .

3. If a' , a'' , a''' are the primary semi-axes of the three confocal surfaces passing through a point, determine in rectangular co-ordinates the equation of its locus when $a' + a'' + a''' = \text{constant}$; and investigate the nature of its traces on the co-ordinate planes.

4. If the general equation of the second degree,

$$ax^2 + by^2 + cz^2 + 2lyz + 2mzx + 2nxy + 2px + 2qy + 2rz + d = 0,$$

represents a paraboloid, determine the form it assumes when the variables are transformed by the following substitutions:

$$x = \xi + \gamma\zeta, \quad y = \eta + \gamma'\zeta, \quad z = \gamma''\zeta,$$

where $a\gamma + n\gamma' + m\gamma'' = 0$, $n\gamma + b\gamma' + l\gamma'' = 0$, $m\gamma + l\gamma' + c\gamma'' = 0$;

and deduce by means of these transformations the remarkable form of the discriminant in this case.

5. If α is the amplitude of $\frac{Fk}{3}$, and if β is the amplitude of $\frac{2Fk'}{3}$, prove that the product of the imaginary roots of the equation which determines the trisection of Fk is

$$\frac{1 - \cos^2 \alpha \cos^2 \beta}{\cos^2 \beta + k^2 \sin^2 \alpha \sin^2 \beta},$$

where $k^2 + k'^2 = 1$.

6. Adopting the usual notations of elliptic functions, prove that

$$\Pi(-(1-k'), k, \phi) = \frac{1+k'}{2k'} F(k, \phi) + \frac{1}{4k'} \log \frac{\Delta(k, \phi) - (1-k') \sin \phi \cos \phi}{\Delta(k, \phi) + (1-k') \sin \phi \cos \phi},$$

where $k^2 + k'^2 = 1$.

7. If p denotes any odd number, and

$$a_m = am \frac{mFk}{p},$$

prove that the equation connecting the amplitudes in Jacobi's transformation can be written under the form

$$\tan \left(\frac{\pi}{4} - \frac{\psi}{2} \right) = \frac{\tan \frac{1}{2} (a_1 - \phi) \tan \frac{1}{2} (a_3 + \phi) \dots \dots \tan \frac{1}{2} (a_{p-2} + \phi)}{\tan \frac{1}{2} (a_1 + \phi) \tan \frac{1}{2} (a_3 - \phi) \dots \dots \tan \frac{1}{2} (a_{p-2} - \phi)} \tan \left(\frac{\pi}{4} \mp \frac{\phi}{2} \right),$$

when

$$\beta F(k\phi) = F(h\psi);$$

and determine accurately the cases where the upper or lower signs are to be used.

8. Retaining the notation of the last question, let

$$\mu_r = am \frac{rFk}{2p},$$

prove that

$$(\sqrt{1+h} + \sqrt{1-h}) \sin \mu_1 \sin \mu_3 \dots \sin \mu_{p-1} = \sqrt{2} \sin^2 a_1 \sin^2 a_3 \dots \sin^2 a_{p-2}.$$

9. Given the base of a spherical triangle, and the product of the tangents of the halves of the sides equal to the square of the tangent of one-

fourth of the base; find the locus of the vertex, and prove that its arc is represented by an elliptic function, and reduce it to its fundamental form.

10. If $\alpha_1 = \text{am } \frac{Fk}{4}$, $\alpha_2 = \text{am } \frac{Fk}{2}$, $\alpha_3 = \text{am } \frac{3Fk}{4}$, find the algebraic value of $E(k_1 \alpha_1) + E(k_1 \alpha_2) - E(k_1 \alpha_3)$.

DR. HART.

1. Prove that the secular part of the disturbing function in a planetary orbit can be expressed in the form

$$m' \left\{ \frac{C_0}{2} + \frac{D_1 a a'}{8} (e^2 + e'^2 - \tan^2 i - \tan^2 i' + 2 \tan i \tan i' \cos (\Omega - \Omega')) \right. \\ \left. = \frac{D_2 a a'}{4} e e' (\cos \varpi - \varpi') + \text{terms of a higher order} \right\}.$$

2. Show how to calculate the coefficients $C_0 D_1 D_2$ in the above expression as elliptic integrals.

3. Find from this expression the motion of the aphelia of two planets subject only to their mutual disturbance.

4. Investigate the effect of a resisting medium on the eccentricity of a planet's orbit.

5. How did Newton compute the first term in the value of c which gives the motion of the Moon's perigee?

6. How did he compute the effect of the "variation" on the motion of the Moon's nodes?

7. Calculate the value of $\int \frac{T}{h^2 \omega^3} d\theta$ in the Lunar theory accurately enough for a second approximation, and show the effect of each term on the expression for the time in terms of the longitude.

8. If V be the potential of a system of masses attracting with forces that vary inversely as the square of the distance, how does Gauss investigate the value of the function

$$\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2}$$

for a point within one of the masses?

9. How is the investigation modified if the attracting masses are distributed over a surface?

10. Find the expression, in a series of Laplace's coefficients, for the potential of a heterogeneous body acting on an internal point; the body being composed of shells nearly spherical.

PROFESSOR JELLETT.

1. Assuming the truth of Lagrange's equations for the variation of arbitrary constants, namely,

$$(A) \quad \frac{da}{dt} = -\frac{d\Omega}{dl}, \quad \frac{dl}{dt} = \frac{d\Omega}{da}, \text{ \&c.,}$$

explain the nature and origin of the various kinds of non-periodic terms which may appear in the value of Ω .

a. Show that the method of Lagrange may naturally be expected to give rise to such terms, even though not essentially connected with the question.

b. Show that the first perfectly non-periodic term which is found in Ω is of an order two degrees higher than that of Ω itself.

c. The equations (A) may sometimes be so treated as to avoid these non-periodic terms.

d. If such a term do occur, how far is the use of the method of Lagrange restricted?

2. Deduce the equations by means of which Lagrange determines the components (round fixed axes) of the angular velocity of a solid body moving in consequence of an initial impulse.

3. Prove that the equations of rotation of the Earth round its centre of gravity are

$$dp = 0.$$

$$\frac{dq}{dt} + \frac{C-B}{A} rp = \frac{C-B}{A} (P \cos \phi - P' \sin \phi);$$

$$\frac{dr}{dt} + \frac{A-C}{B} pq = \frac{A-C}{B} (P' \cos \phi + P \sin \phi),$$

where

$$P = \frac{3L}{r^5} \left\{ \left(\frac{y^2 - z^2}{2} \right) \sin 2\theta + yz \cos 2\theta \right\};$$

$$P' = \frac{3L}{r^5} \left\{ xy \sin \theta + xz \cos \theta \right\},$$

L being the mass of the disturbing body, r its distance, and x, y, z its co-ordinates—

a. Show that the change in the obliquity of the ecliptic depends wholly on P' , and the change in the position of the equinoctial points wholly on P .

b. Show that there is no term depending on the initial circumstances of the motion.

c. Explain the method of determining, by means of the precession, limits within which the Earth's ellipticity must lie.

4. Assuming Laplace's expression for the inclination of the equator to the fixed ecliptic, namely,

$$\begin{aligned} \theta = h - \Sigma \frac{le}{f} \cos (ft + \beta) + \frac{\lambda d'}{1 + \lambda} \cos (f't + \beta') \\ + \frac{l \tan h}{2m(1 + \lambda)} \left\{ \cos 2v + \frac{m}{m'} \lambda \cos 2v' \right\}. \end{aligned}$$

a. Show that by a suitable determination of the fixed ecliptic the terms depending on the motion of the solar orbit may be neglected for times near the epoch.

b. Determine the secular variation of the apparent ecliptic.

c. Which of the terms in the value of θ is the most important, and why?

5. Determine the equation of equilibrium of a flexible and inextensible surface according to the method and definition of Lagrange.

a. Whatever be the nature of the forces acting on the membrane, the following property holds:—

If a curve be traced on the surface between two given points, the velocity acquired by a particle in moving from one point to the other along this curve under the action of the forces is independent of the nature of the curve.

b. Hence, if $Xdx + Ydy + Zdz$ be not a perfect differential, the equation of the surface may be written under the form

$$Ap + Bq = 1,$$

A, B , being functions of x, y, z , X, Y, Z , being also functions of the co-ordinates.

c. Adopting Gauss's definition of an inextensible surface, it is impossible to find from the statical equations the equation of the surface of the membrane.

6. Investigate the equations of equilibrium of a solid body according to the method of Lagrange, and prove the mathematical theorem made use of in his demonstration.

7. Investigate the equation of the ellipsoid of elasticity according to Lamé's definition, and show that the elastic forces corresponding to its principal planes are normal to these planes.

8. Determine the equations of motion of an elastic homogeneous uncrySTALLINE solid acted on by forces satisfying the condition

$$Xdx + Ydy + Zdz = dV,$$

and show that if we assume

$$\xi = \frac{dw}{dy} - \frac{dv}{dz}, \quad \eta = \frac{du}{dz} - \frac{dw}{dx}, \quad \zeta = \frac{dv}{dx} - \frac{du}{dy},$$

u, v, w being the displacements, each of the quantities ξ, η, ζ , satisfies the equation

$$\frac{d^2}{dt^2} = c \left(\frac{d^2}{dx^2} + \frac{d^2}{dy^2} + \frac{d^2}{dz^2} \right).$$

9. Deduce Professor M'Cullagh's equation for determining the polarizing angle in the case of a uniaxial crystal whose axis is contained in the plane of incidence.

a. Show from this value that when light is reflected at the common surface of a crystal and a fluid, the polarization is under certain circumstances incomplete.

10. If a beam of circularly polarized light pass through a thin plate of a uniaxial crystal, bounded by planes perpendicular to the axis, and, after having been analyzed, fall on a screen; find the expression for the wave disturbance at any point of the screen.

11. If the equation of a *surface de niveau* of a fluid in equilibrio be

$$r = a \{ 1 + \alpha (Y_0 + Y_1 + Y_2 + \&c. ;) \}$$

show that for the outer surface

$$\int_0^1 \rho a (a^{i+3} Y_i) = \frac{2i+1}{3} a^i Y_i \int_0^1 \rho d.a^3,$$

no external forces being supposed to act.

12. If a solid, whose form is nearly spherical, be covered by a fluid stratum, the centre of gravity of the whole body will coincide with the centre of gravity of the surface of the fluid.

1. If a number of material points, connected by known relations, and under the influence of given forces, receive given initial velocities, show that the initial values of the internal forces may always be determined by a series of simple equations.

a. If no initial velocities be communicated to the points, and if it be possible to assign to each of these points a displacement coincident with and proportional to the acting force at that point, the initial values of the internal forces will in general vanish?

b. Show from physical considerations that this might have been anticipated. [N. B.—The equations of condition are not supposed to contain the time explicitly.]

2. If an inflexible rod move under the action of given forces, and subject to given geometrical conditions, state accurately the relation between the *wrenching* force at any point and the *lost* forces of the system, and apply the result to the following question:—

If a rigid rod move, in obedience to a primitive impulse only; with its extremities resting each on one of two lines at right angles to each other, determine the time and point at which it is most likely to break.

3. If a cylinder of any form be laid on a horizontal plane, and slightly disturbed from its position of equilibrium (supposed stable); show that the length of the simple equivalent pendulum is

$$\frac{\text{Moment of inertia round line of contact}}{\text{Mass} \times (R - \delta)};$$

where R = radius of curvature of transverse section at the point of contact, and δ = height of centre of gravity.

4. Four equal particles, exercising no attraction on each other, move in an ellipse under the action of a central force situated in the centre; at the commencement of the motion they were situated at the extremities of the axes. If at any time they become suddenly connected with each other so as to form a rigid system, find the angular velocity of this system.

Experimental Physics.

PROFESSOR JELLETT.

LIGHT.

1. If light whose rectangular components are

$$x = \cos \alpha \sqrt{\frac{\lambda}{a}} \sin \frac{2\pi}{\lambda} (vt - r)$$

$$y = \sin \alpha \sqrt{\frac{\lambda}{a}} \sin \frac{2\pi}{\lambda} (vt - r)$$

for each homogeneous ray of which it is composed, be passed through an analyzer, what will be the appearance presented as the analyzer is turned round?

2. Given a ray of elliptically polarized light, show how to measure accurately the position and ratio of the axes of the ellipse.

a. Show that the existence of a very small amount of elliptic polarization may be detected by a delicate analyzer, and state the uncertainty to which this method is liable.

3. State the hypothesis of Brewster as to the composition of white light, and mention some of the experiments by which it is supported.

4. If the rings which are seen when a crystalline plate is interposed between two tourmalines were produced by a depolarizing action in the crystal, how would the phenomena differ from those which are actually seen?

5. The expression for the intensity of polarized light falling on a screen being

$$\phi(\alpha) + (m^2 x^2 + n^2 y^2 - \lambda^2) \psi(\alpha)$$

describe the appearance presented, α being the azimuth of the plane of polarization and x, y , the co-ordinates of a point in the screen.

- a. If the equations

$$\phi(\alpha) = 0, \quad \psi(\alpha) = 0,$$

give real values for α , describe the appearances which will be presented as the polarizer is turned round?

HEAT.

1. How does Biot deduce from Melloni's experiment the law of the absorption of heat in passing through a diathermal plate?

2. If a body cool in an empty enclosure, whose temperature differs from that of the body by a given quantity, it is found that when the temperature of the enclosure increases arithmetically, the velocity of cooling increases geometrically. Hence, and from the hypothesis of mutual radiation, deduce the law of cooling.

3. How does Gay-Lussac obtain the tension of vapours at temperatures lower than 0 centig.

a. Show by direct experiment that vapours are formed from ice.

4. Explain the method of determining the specific heat of a body by plunging it into a liquid whose specific heat is known.

a. Show how to remove the effects of the two sources of error, namely — 1. The absorption of heat by the vase; 2. The cooling which takes place during the experiment.

b. Show that the error in the result arising from an error in the measurement of the final temperature will be the least if this temperature be an arithmetic mean between the temperatures of the body and the fluid.

ELECTRICITY.

DR. LLOYD.

1. According to what law does the loss of electricity of an electrized body, due to the contact of the air, vary; and how is it expressed?

2. What is the law of tension of electricity in the voltaic pile, one of the poles being in connexion with the earth?

3. In what manner does the resistance of the pile vary with the number, magnitude, and interval of the plates?

4. Describe Mr. Wheatstone's method of comparing electro-motive forces experimentally; and prove its validity.

5. How does M. Becquerel obtain the absolute thermo-electric powers of the several metals, the differences of their powers being given by experiment?

6. A horizontal magnet is acted on by a vertical current of indefinite length, which is equally distant from the two poles of the magnet; prove that the force exerted is equal to

$$\frac{\mu l}{r^2};$$

l being the length of the magnet, and r the horizontal distance of the poles from the conductor.

7. A magnetic needle is moveable on a fixed point in the horizontal plane, and is acted on by a horizontal conducting wire situated in any vertical plane passing through the point; find the expression for the directive force.

8. Prove that the force exerted by a closed circuit on the pole of a magnet passes through the pole.

9. Two magnets of unequal strength are suspended successively by the same wire or thread, and in the horizontal position; find the position of the plane of detorsion of the thread, the angle contained by the axes of the two magnets being known, and also the ratios of the torsion force to the magnetic force for each of them.

10. In Gauss's method of deflection, show that the moment of the force opposed to the action of the deflecting magnet is

$$(mX \cos u_0 + H) \sin (u - u_0),$$

H being the coefficient of torsion, and α and α_0 the angles formed by the axis of the magnet with the magnetic meridian, when the deflecting magnet is present and removed.

11. Given the inclination of the dipping needle, in any plane whose azimuth is known, deduce thence the inclination in the plane of the magnetic meridian, or the dip.

12. The time of vibration of a bifilar magnet in its ordinary position (perpendicular to the magnetic meridian) is a geometric mean between the times of vibration in the magnetic meridian, with the poles direct and reversed. Prove this.

13. Describe the pyrheliometer of M. Pouillet, and the manner of using it.

14. Prove that the quantity of heat received from the sun in a day, on a given surface, and at the equinoxes, is proportional to the cosine of the latitude.

15. Describe M. Bravais' method of determining the height of clouds by observation; and deduce the formula employed.

Mental and Moral Science.

DR. TOLEKEN.

1. The approximation of Aristotle to some recent philosophical views is pointed out by Schwegler? He shows, however, that unsubdued dualism is still to be found in three important Aristotelian doctrines?

2. Give an account of the principal theories which have been proposed respecting Space and Time; and state the objections to which each seems exposed. Kant's entire system is founded on his peculiar views upon this subject?

3. How does Kant compare and contrast General and Transcendental Logic?—and what explanation does he give of the nature and limits of the "Analytic of Principles"?

State exactly what he means by the "Transcendental Synthesis of the Imagination"; and point out the importance of this operation in his general system.

4. Classify the forms assumed by Idealism previously to the time of Kant, and discuss his proposed refutation. He attempts to confirm his argument from a consideration of the conditions necessary to prove the objective validity of the categories?

5. On what principle does Kant arrange the paralogisms of Psychology, and how does he show them to be deceptive? Cousin's enumeration is incomplete, and leads to a partial consideration of an important question? Idealism is unavoidable on the Rationalistic System?

6. Explain Fichte's method of deriving the categories of Substance and Cause; and point out the relation of his theory to that of Spinoza.

Give Mr. Mansel's general comparison of the earlier philosophies of Fichte and Schelling.

7. Examine the different theories which have been proposed to explain the process of attention, and the difficulties which have been suggested in respect to this operation.

8. Discuss the question respecting the way in which we acquire the knowledge of extension in reference to the theories of Platner, Sir William Hamilton, and Mr. Mansel.

9. In considering the question as to whether there can be a Science of Psychology, Mr. Mill criticizes the method employed by certain writers of his own school?

He gives instances to prove the necessity of such a Science, and makes an important observation as to the way in which organic differences may influence mental phenomena?

Give a summary of his views respecting Ethology, and its relation to Psychology.

10. Sir William Hamilton notices several exaggerations of the principle of Association, and points out the connexion of one of these with another very general but erroneous opinion? State the principal objections to the latter.

11. Mr. Mansel, in deriving the laws and limitations of Thought in general, differs from (a) Mr. Mill, and (b) Kant?

12. Prove that the scholastic interpretation of the Aristotelian doctrine of Demonstrative Syllogisms is erroneous, and state what Mr. Mansel considers to be the true Aristotelic theory of geometrical reasoning. How does he infer this?

DR. TODD.

1. Give an account of Warburton's doctrine of the origin of Society.

a. How does he differ from Bacon?

b. And from Aristotle?

c. State Warburton's opinion as to the defects of human Society.

d. The protection afforded by Society not properly a reward?

2. State Butler's argument to show that punishment for the good of Society does not imply ill desert.

3. "The opinion of necessity, considered as practical, is false." Give a full abstract of Butler's argument in defence of this proposition.

4. Cicero says: "Virtus omnis tribus in rebus fere vertitur." Explain this. What are the three things?

5. Write an Essay on the Argument from Final Causes, discussing particularly the following topics:—

a. The use made of Final Causes in the Platonic and Aristotelic philosophy.

b. The censure of Final Causes, as "sterile," by Lord Bacon; and his remark, "Magis in hac parte accusandus Aristoteles quam Plato."

c. The relation of the Argument from Final Causes to the Analogical argument of Bp. Butler.

d. The objection from the waste of animal and vegetable life, and from the more formidable consideration of loss of souls.

6. Τὸ δ' ὅτε δεῖ καὶ ἐφ' οἷς καὶ πρὸς οὓς καὶ οὗ ἕνεκα καὶ ὡς δεῖ, μέσον τε καὶ ἀριστον, ὅπερ ἐστὶ τῆς ἀρετῆς. ὁμοίως δὲ καὶ περὶ τὰς πράξεις ἐστὶν ὑπερβολὴ καὶ ἑλλειψις καὶ τὸ μέσον. ἡ δ' ἀρετὴ περὶ πάθη καὶ πράξεις ἐστίν, ἐν οἷς ἡ μὲν ὑπερβολὴ ἀμαρτάνεται καὶ ἡ ἑλλειψις ψέγεται, τὸ δὲ μέσον ἐπαινέεται καὶ κατορθοῦται ταῦτα δ' ἀμφω τῆς ἀρετῆς. μεσότης τις ἄρα ἐστὶν ἡ ἀρετὴ, στοχαστικὴ γε οὕσα τοῦ μέσου. ἔτι τὸ μὲν ἀμαρτάνειν πολλαχῶς ἐστὶν (τὸ γὰρ κακὸν τοῦ ἀπείρου, ὡς οἱ Πυθαγόρειοι εἵκαζον, τὸ δ' ἀγαθὸν τοῦ πεπερασμένου), τὸ δὲ κατορθοῦν μοναχῶς· διὸ καὶ τὸ μὲν ῥάδιον τὸ δὲ χαλεπὸν, ῥάδιον μὲν τὸ ἀποτυχεῖν, τοῦ σκοποῦ, χαλεπὸν δὲ τὸ ἐπιτυχεῖν. καὶ διὰ ταῦτ' οὖν τῆς μὲν κακίας ἡ ὑπερβολὴ καὶ ἡ ἑλλειψις, τῆς δ' ἀρετῆς ἡ μεσότης.

ἰσθλοὶ μὲν γὰρ ἀπλῶς παντοδαπῶς δὲ κακοί.

* Ἔστιν ἄρα ἡ ἀρετὴ ἕξις προαιρετικὴ ἐν μεσότητι οὕσα τῇ πρὸς ἡμᾶς, ὠρισμένη λόγῳ καὶ ὡς ἂν ὁ φρονιμος ὁρίσειεν.

Translate this passage, and write a commentary upon it, with especial reference to the Aristotelic principle of μεσότης.

7. Give an account of the Ideal Theory of Plato, as explained by Archer Butler; showing its relation to Dialectics as well as Ethics.

8. Explain the Platonic conception of Matter, as contrasted with that of Aristotle, Des Cartes, and Locke. Plato and Aristotle used different Greek words to express the *materia* of modern philosophers?

9. Give an account of the principal doctrines in Aristotle's Ethics, which appear to have been borrowed from Plato.

10. Explain the principal differences between the Ethical doctrines of Aristotle and Plato.

11. Give an account of Archbishop King's theory on the Origin of Evil.

Classics.

MR. STACK.

Translate the following passages into English:—

1. *Beginning*, τοῦτο μὲν εἰδὼς ἄπαθε Μάγνης ἄμα ταῖς πολιαῖς κατιούσαις, κ. τ. λ.

Ending, θόρυβον χρηστὸν ληναίτην.

ARISTOPHANES, *Eq.*, 520.

2. *Beginning*, ἀλλὰ παλαιὰ γὰρ, κ. τ. λ.

Ending, ἕκαλος ἐπειμὶ γῆρας ἕς τε τὸν μορσιμον αἰῶνα.

PINDAR, *Isthm.*, vi. 16.

3. *Beginning*, πῶς γὰρ τις ἰχθροῖς ἰχθρὰ πορεύων, φίλοις, κ. τ. λ.
Ending, πησας ἀραίῳν αὐτὸς ἐκπίνει μολῶν.
 ÆSCHYLUS, *Agam.*, 1345.
4. *Beginning*, Πολλὴ μὲν γὰρ ἑκατέροις προθυμία ἀπὸ τῶν, κ. τ. λ.
Ending, αἶι γὰρ παρ' ὀλίγον ἢ διέφευγον ἢ ἀπώλλυντο.
 THUCYDIDES, vii. 70, 71.
5. *Beginning*, Καὶ τῶν μὲν ἄλλων εἰς ἑκάστῳ τις πρόφασις, κ. τ. λ.
Ending, δῆλον ὅτι πάνδεινος εἰ τις.
 DEMOSTHENES, *De Fals. Leg.*, 128-131.
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DR. GRAVES.

Translate the following passages into English :—

1. *Beginning*, Καὶ Τιτυὸν εἶδον, Γαίης ἐρικυδέος υἱόν, κ. τ. λ.
Ending, τὰς δ' ἄνεμος ρίπτασκε ποτὶ νέφεα σκιδέντα
 HOMER, *Odyssey*, xi. 576-592.
2. *Beginning*, ἱὺ γέ, ἔλκε τὸ τῆνον ἱμὸν ποτὶ δῶμα τὸν ἄνδρα, κ. τ. λ.
Ending, ἂ θεὸς ἐν τριόδοισι τὸ χαλκίον ὥς τάχος ἄχει.
 THEOCRITUS, *Pharmak.*, 17-36.
3. *Beginning*, "Οὔ οὖν δὴ τὰ νῦν οἷα τέκτοσιν ἡμῖν ὕλη, κ. τ. λ.
Ending, αἰσθήσει τε ἀλόγῳ καὶ ἐπιχειρητῇ παντὸς ἔρωτι
 PLATO, *Timæus*, s. 43, 44.
4. *Beginning*, Τὰ μὲν πάντα οὐ ῥάδιον, ὦ ἑταῖρε, κ. τ. λ.
Ending, ἐφ' ὃν αἱ ἀσκήσεις αὗται, καὶ οἱ πόνοι ἀγούσιν.
 LUCIAN, *De Gymnasiis*, 15.
-

MR. STACK.

Translate the following passage into Greek Prose :—

- Beginning*, If, too, there be indeed any one who fancies that the Syracusans, ...
Ending, neither ye nor others have shown any such promptitude.
 From Translation of *Thucydides*.
-

DR. GRAVES.

Translate the following passage into Greek Tragic Iambics :—

- Beginning*, Gordon. My Prince!
Ending, For still unsteady are the scales of fate.
 COLERIDGE, *The Death of Wallenstein*, act v. sc. 2.

MR. STACK.

Translate the following passages into English :—

1. *Beginning*, St. Male morigerus mi est danista, qui de me argentum
haud petit.
Ending, Pedibus esse provocatum. Abeo intro : nimis longum loquor.
PLAUTUS, *Epid.* v. 1.
2. *Beginning*, Nos tacemus et eo magis, ...
Ending, Tusculanum proscripsi : suburbano non facile careo.
CICERO, *Ep. ad. Att.*, iv. 1, 2.
3. *Beginning*, Continuo auditæ voces vagitus et ingens.
Ending, Alligat, et noviens Styx interfusa coerces.
VIRGIL, vi. 426.
4. *Beginning*, Principio cælum acterras camposque liquentis.
Ending, Rursus et incipiant in corpora velle reverti.
VIRGIL, vi. 730.
5. *Beginning*, Etai me assiduo confectum cura dolore.
Ending, Hinc manat tristi conscius ore rubor.
CATULLUS, *In Hort.*

DR. GRAVES.

Translate the following passages into English :—

1. *Beginning*, O funde noster, seu Sabine, seu Tiburs, ...
Ending, Qui tunc vocat me, cum malum legit librum.
CATULLUS, *Carmen* xlv.
2. *Beginning*, At nunc divitibus cœnandi nulla voluptas, ...
Ending, Tempore et exiguæ furtis imbutus ofellæ.
JUVENAL, *Sat.* xi. 120-144.
3. *Beginning*, Secundum eos citati nimis callidi exsolvendi.
Ending, mercenariumque increpantes vocarent, qui accepisset.
LIVY, lib. xxiv. c. 19.
4. *Beginning*, Plagis confectum dico a lictoribus tuis civem.
Ending, abutebatur ad nocturna vota cupiditatum suarum.
CICERO, *in C. Verrem*, Act. II. lib. v. c. 54.

Translate the following passage into Latin Prose :—

Beginning, Upon this, however, the question will arise, ...

Ending, nor properly to be repudiated by a philosopher.

H. TAYLOR, *Notes from Life—Of Wisdom.*

MR. STACK.

Translate the following passage into Latin Verse :—

Beginning, Why should we fear, youth's draught of joy, ...
Ending, But we shall still have Thee.

KEBLE's *Christian Year*.

ANCIENT HISTORY.

DR. GRAVES.

The Candidates are required to discuss the following questions in the form of short Essays :—

1. On the political consequences of the *social* system established by Lycurgus.
2. On the superintendence of the national religion exercised by the State at different periods in the history of Rome.
3. On the operation of the federal principle among states in ancient times.

MR. STACK.

On the effect produced upon *political* ideas, in passing from ancient to modern times, by the change,

1. Of *Race* ;
2. Of *Religion*.
3. On the effects political, social, &c., of the division of the Hellenic race into its *Tribal* distinctions.

Discuss the following subjects, in the form of short Essays :—

1. The peculiar character of the age of Alexander as an epoch in Greek literature. Trace this character in the several departments of literature.
2. What the literatures of Greece and Rome have done severally for the intellectual progress of Europe. Point out the chief elements contributed by each.
3. The reasons why the study of the Greek and Latin languages is especially suited for educational purposes.
4. The effects produced on the Greek language by the Macedonic conquests.
5. The mixture of dialects in the Homeric poetry. To suggest an historical explanation of this fact.
6. The absence, generally, of political allusions in Attic Tragedy—considered in connexion with the important character of the contemporary events, and the constant allusions to them in the Comic Drama.

7. The forms which philosophical exposition successively assumed in Greece.

8. A comparison of the difficulties of scientific inquiry into the structure of the Greek and the Latin languages.

9. A comparison of the effects of the peculiar literary training of the Flavian period in Rome on Poetical and on Historical Composition.

HEBREW AND CHALDEE.

DR. TODD.

I. The root from which the title of the Book of Proverbs is derived has two different significations, or rather there are two different roots with the same radicals?

II. That from which the word translated 'Proverb' is derived has cognate words in Hebrew with which Greek and Latin words seem to be related?

III. What is the form of the word in Chaldee and Syriac?

IV. From the root in the other signification a remarkable Greek word is derived?

V. Give the divisions of the Book of Proverbs according to the titles that occur in different parts of it.

1. From one of these titles it has been inferred that the collection of Proverbs attributed to Solomon was not all made by him, or in his time?

2. Two appendices to the book contain Proverbs which are apparently attributed to other authors?

3. Commentators have endeavoured to show that these also are really Solomon's. Give an account of the different opinions.

VI. Translate:—

מִיָּהוּה מַצְעֵדֶנְגֶּר (a)

וְאִם מִהֵינֶן דְּרֹו :

מוֹקֵשׁ אָדָם יֵלֶע קֶרֶשׁ (b)

וְחֹדֶר מְרִים לְבָקֶר :

מִזְרָה וְשֵׁעִים מֶלֶךְ חֹכֶם (c)

וְיֹשֵׁב עֲלֵיהֶם אֹרֶשׁ :

חֲפֹדֵי חֶבֶד בְּמִשְׁכִּית כֶּקֶף (d)

דָּבָר דָּבָר עַל־אֲפָנָן :

1. The word יֵלֶע in (b) is accented in the Masoretic Bibles יֵלֶע. This accentuation shows the opinion of the Masoretic doctors of the parsing of the word, and its root?

2. The English Version follows the accents; but the LXX. give a different version, and seem to derive the word from a different root?

3. The Chaldee paraphrase of this passage is as follows:—

שָׁמַיָא דְּמֵא לְבָרָא דְּמֵר לְקִדְשָׁא
 גִּבְרָא דְּכִי דְּמֵא לֵיה נִסְיָא :

Translate this; and show what opinion it favours as to the signification of לֵל.

4. The Authorized English Version gives different renderings of the word שָׁמַיָא in (c) and (d). Show that the translators are correct in both places.

VII. Give the passages of the Book of Proverbs which have been quoted in the New Testament.

VIII. At the end of the Book of Proverbs there is the following Masoretic note:—

חזק

סבסס פסוקים של ספר משלי חשש מאד החמשה עשר: ור' אשר דברה סימן:
 חזקו לפני שבר גאון: וסודו שמותיה הן חלץ לבנה ודך סימן:

1. Translate and explain this.
2. Some copies read

וסימן חזק מו'

instead of

חזקו דברה סימן

as above. Show that this is no real difference.

- IX. Translate and point the following passage:—

יהוה בחכמה יסד יסוד
 טוב שמים בתבונה:
 ברעו החומות נבקעו
 ושחקים ידעו מל:

- a. Point out the alternate parallelism in these verses.

b. What are the Greek and Latin terms used by the LXX. and Vulgate, respectively, to represent the words, חכמה, תבונה, and רעו.

X. Translate the following note (from the Midras Tehillim) on the words

אל אלהים יהוה דבר

in Psal. l. 1:—

למה הזכיר שמו של ה'ה' שלשה פעמים: ללמד שבשלשה שמות הללו ברא
 ה'ה' העולם בנגד שלש מדות שבין נברא העולם: ואלו הן החכמה הרעו
 והתבונה: חכמה מניין ש' בחכמה יסד רעו: מניין ש' ברעו החומות
 נבקעו: תבונה ש' טוב שמים בתבונה וכן היא אומר כי אנכי "אלוהיך אל
 קנא: דהי שלש מדות שבין נברא העולם: וכן בני גר וברי ראובן אומרים
 אל אלהים "הוא ידע: ומה ראו לאמר שני פעמים אל אלהים "שבין
 נברא העולם: אל אלהים "שבין ניהנה התורה:

a. Give the meaning of the contractions

הָיָה. שָׁן. 'ו'.

b. What is the signification of the double ' in Rabbinical orthography, as in the word כִּיָּן in this passage? Signification of the double " and ך in the Chaldee Paraphrase?

XI. Translate:—

לְתַאֲוֵהָ יִבְקֹשׁ נִסְתָּר (a)

בְּכָל-הָעֵשָׂה יִתְגַּלֵּעַ :

פִּינִיטָר מִים רַאשֵׁיהֶן מְדוּן (b)

וְלִקְנִי הָתְגַלֵּעַ הָרִיב נִמְשׁוֹשׁ :

בְּבֹד לְאִישׁ שֶׁנָּח מְרִיב (c)

וְכָל-אֱרֵץ יִתְגַּלֵּעַ :

1. In these passages there is a root which occurs nowhere else in the Bible. What meaning is assigned to it by our Authorized English Version, Buxtorf, and the older Lexicographers? What meaning is assigned to it by Gesenius and the modern Lexicographers?

2. There is another Hebrew root cognate with this? There are also similar words in Sanscrit, Greek, and Latin, which confirm the meaning assigned to this word by modern philologists?

3. The English textual version of (a) is inconsistent with the Masoretic accents; the marginal version is in accordance with the accents, but gives a different sense?

4. The LXX. translate (a) thus:—

Προφάσεις ζητεῖ ἀνὴρ βουλόμενος χωρίζεσθαι ἀπο φίλων, ἐν παντί καιρῷ ἐπονειδιστος ἔσται.

From this it appears that the LXX. must have had different readings in the words רַאשֵׁיהֶן, הָרִיב, and יִתְגַּלֵּעַ. What readings?

XII. Translate the following Chaldee Paraphrase on Prov. ix. 7-9:—

וְיָדִי מִסִּימָא וְנָסִיב לִיהָ צִנְיָא 7.

וּמְרַבְּנָא מִסִּימָא דִּיהָ לִיהָ :

לָא תִכְסֵּי לְמִסְמָא דְלָא נִסְתָּר 8.

אִכְסֵּי לְחִימָא דְנִתְחַבֵּי :

אִלָּן לְחִימָא וְתִתְחַבֵּי 9.

תִּיב אִדְעָ וְיִסְתָּר וְיִסְתָּר מִסִּימָא :

a. Parse and give the roots of וְיָדִי (ver. 7), and תִּכְסֵּי (ver. 8).

b. The word צִנְיָא (ver. 7) has a different signification elsewhere? But in the Targum on the Book of Proverbs, as here, represents what Hebrew word?

c. Explain the apparent irregularity of the preformative ך in נססך, and דנחמך (ver. 8).

d. נססך (ver. 9). Explain the ך in this word, and give the root.

XIII. Give an account of Dr. Wall's theory of the vocalization of the Hebrew Bible.

SCHOLARSHIP EXAMINATION.

Examiners.

HUMPHREY LLOYD, D. D., Vice-Provost.
 JOHN LEWIS MOORE, D. D.
 THOMAS LUBY, D. D.
 ANDREW SEARLE HART, LL. D.
 CHARLES GRAVES, D. D.
 THOMAS STACK, M. A., Regius Professor of Greek.
 JOSEPH A. GALBRAITH, M. A., Professor of Experimental Philosophy.
 JOHN K. INGRAM, LL. D., Professor of English Literature.

Science Scholarships.

DR. HART.

DIFFERENTIAL AND INTEGRAL CALCULUS.

1. Find a maximum or minimum value for y in the equation

$$(y-1)(x+y+1)^2 = (x^2+2y+3)^2.$$

2. Find the value of $\frac{e^x - e^{-x} - 2x}{\tan x - x}$ when $x = 0$.

3. Find whether $(1+x)^{\frac{1}{x}}$ is capable of a maximum or minimum value.
 4. Change the independent variable from x to θ in the equation

$$\frac{d^3y}{dx^3} + ax \frac{dy}{dx} + b = 0,$$

where $x = \tan \theta$.

5. Find the length of the arc of a parabola cut off by the focal ordinate.

6. Compute the area and length of the cycloid whose equation is

$$x = a \cos^{-1} \left(1 - \frac{y}{a} \right) - \sqrt{2ay - y^2}.$$

7. Find the area of the surface and the volume of the solid generated by the revolution of this cycloid about its base.

8. Find the number and nature of double points on the curve

$$x^4 - 4ax^3 + 4a^2x^2 - b^2y^2 + 2b^2y - a^4 - b^4 = 0.$$

9. Find the form of the curve $8x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$, and the length of its circumference.

10. Integrate $\int \frac{x^3 dx}{x^7 - ax^6 + x^5 - ax^4 - x^3 + ax^2 - x + a} + \int \frac{dx}{x^7 - 1}.$

11. Integrate $\int \frac{dx}{a + b \sin x} + \int \frac{(1+x^2) dx}{(1-x^2) \sqrt{1-x^2}}.$

12. Seek a point from which if perpendiculars be drawn to the three sides of a triangle, their fourth proportional shall be a maximum or minimum, and explain the result.

GEOMETRY.

1. What are the conditions that the equation

$$6x^3 + Ax^2y + Bxy^2 + 7ax^3 + Cxy + Dy^3 + a^3 = 0$$

should represent three right lines?— a being given, and A, B, C, D to be determined.

2. What additional condition is necessary that these lines should pass through the same point?

3. Find the magnitude and position of the axes of the ellipse

$$5x^2 + 2xy + 5y^2 + 4ax - 28ay + 20a^2 = 0,$$

1st, if the axes be rectangular;

2nd, if they make an angle of 60° .

4. Find the length of the chord which is normal to a given ellipse at a given point.

5. Find the locus of the poles with respect to a given conic of the tangents to another conic.

6. Find the locus of the centres of conics touching the three sides of a given triangle and the circumscribing circle.

7. If one focus of a conic, inscribed in a given triangle, lies on the circumference of the inscribed circle, find the locus of the other focus.

8. Find the locus of the intersection of normals at the extremities of a chord which passes through a given point.

9. Find the envelope of chords of a conic which subtend a given angle at a given point on the curve.

10. Deduce the equation of the tangent in the form,

$$a\sqrt{\frac{l}{\alpha}} + \beta\sqrt{\frac{m}{\beta}} + \gamma\sqrt{\frac{n}{\gamma}} = 0,$$

from the equation of the line joining two points on the conic

$$\sqrt{la} + \sqrt{m\beta} + \sqrt{n\gamma} = 0.$$

11. Find the envelope of ellipses the position of whose axes are given, and

1st, their sum; or

2nd, the sum of their squares.

ALGEBRA AND TRIGONOMETRY.

1. Prove the equations $\cos \frac{\pi}{7} + \cos \frac{3\pi}{7} = \cos \frac{\pi}{3} + \cos \frac{2\pi}{7}$,

$$\sin \frac{\pi}{14} \sin \frac{5\pi}{14} = \sin \frac{2\pi}{21} \sin \frac{5\pi}{21}.$$

2. If Δ be the area of a spherical triangle, deduce the value of $\tan \frac{1}{4}\Delta$ from the values of the sines and cosines of the half angles in terms of the sides.

3. Find the number of real roots of the equation

$$x^4 - 5x^3 - x + 7 = 0,$$

and approximate to their values as far as the first decimal place.

4. If three roots of the equation

$$x^4 + px^3 + qx^2 + rx + s = 0$$

be proportional, prove that

$$x^3 + rx^2 + qsx + ps^2x + s^3 = 0.$$

5. Find the condition that

$$x^4 + px^3 + qx^2 + rx + s = 0$$

shall have two equal roots.

6. What additional condition is necessary that three of its roots may be equal?

ASTRONOMY.

PROFESSOR GALBRAITH.

1. State the formula of interpolation which is to be used for equal intervals.

2. Apply it to the following case, proceeding as far as second differences. The distance of the Moon's centre from a star is as follows:—

At Noon,	34°	6'	18"
III ^h .	35°	28'	13"
VI ^h .	36°	51'	13"

Calculate the distance at 1^h 31^m 51^s.

3. The declinations of the Sun at noon, taken from the Nautical Almanac, are as follows:—

June 19, ...	23°	26'	55"
20, ...	23°	27'	25".5
21, ...	23°	27'	31".3
22, ...	23°	27'	12".2

Find the time at which it reaches its greatest declination.

4. The front of a house in latitude 50° 44' N. makes an angle of 25° with the meridian from the N. towards the W. At what o'clock on mid-winter-day will the Sun commence to shine on the rooms on that side?

5. Assuming the periodic time of Jupiter to be 4332 days, and the interval from eastern to western quadratures to be 174 days; calculate his annual parallax, and distance from the Sun, as compared with that of the Earth.

6. For a given latitude, find the declination of a heavenly body which in its diurnal motion will pass from one given parallel of altitude to another, in the shortest possible time.

7. Explain the method of finding the latitude at sea by observing a double altitude of the Sun. State the most advantageous formulæ for the solution of each triangle; also the mode of allowing for the ship's motion.

8. In order to calculate the base of the first triangle, it is usual to consider it isosceles, each side being the mean value of the two codeclinations. Show that the error on the base is expressed as follows, in terms of the difference of declinations :—

$$(\text{Error})'' = \frac{1}{2} \frac{\cos \frac{1}{2} C (\text{diff.})^2}{\sin c \ 206265},$$

C being the vertical angle, and c the base.

9. A transit instrument is placed approximately in the meridian; in order to discover the deviation in seconds E. or W. of the true meridian, an observation is made of the time of passage of an equatoreal star, and also of that of the upper transit of a circumpolar star; then if

$$\Delta (\text{seconds}) = \text{diff. of R. A.} - \text{diff. of times},$$

prove that

$$(\text{Deviation})'' = \Delta \times \frac{\cos d \cos d'}{\sin (d' - d) \cos \text{lat.}}.$$

10. Another way of obtaining the deviation is to observe the interval between an upper and lower transit of a circumpolar star, e.g. Polaris (Dec. = $88^\circ 34'$), and subtracting 12 hours; show that for the latitude of Dublin,

$$(\text{Deviation})'' = \frac{\text{Remainder in seconds}}{3.068}.$$

DR. LLOYD.

STATICS.

1. In a system of bodies, prove that the sum of the products of the masses into the squares of their distances from a given point will be a minimum, when the point is the centre of gravity of the system.

2. Let three forces be applied perpendicularly to the middle points of the sides of a triangle, and in its plane; prove that they will be in equilibrium, when they are proportional to the sides of the triangle.

3. Two heavy spheres rest on two inclined planes, and against each other; find their position of equilibrium.

4. A heavy straight rod moves in a vertical plane round a hinge at the lowest point, and is supported by a weight connected with its upper ex-

tremity by a cord passing over a pulley vertically above the hinge; find its position of equilibrium.

5. Two given weights are connected by a cord, which is laid across a horizontal cylinder; find their position of equilibrium.

6. A weight, resting on a curve, is drawn by another weight hanging freely, and connected with it by a string passing over a fixed pulley; determine the equation of the curve, so that there shall be equilibrium in every position of the weights.

DYNAMICS.

1. A heavy body resting on an inclined plane is drawn up by another body hanging freely, and connected with it by a cord passing over the top of the plane; required the inclination of the plane, so that the body may be raised to a given height in the least time.

2. An imperfectly elastic body strikes against a fixed plane; find the direction and velocity of its motion after reflexion.

3. A circular pendulum vibrating in small arcs is retarded by the friction of its point of support; prove that the time of vibration is not thereby altered.

4. Integrate the equation of motion of the pendulum, taking into account the resistance of the air proportional to the velocity; and find the time of vibration.

5. A heavy ball, attached by a string to a fixed point, is made to describe a vertical circle; find the tension of the string at any point, the tension at the highest point being given.

6. Find the law of the force tending to the pole, by which a particle is made to describe the equiangular spiral.

7. A particle describes a curve about a given centre of force, with a velocity inversely as the n^{th} power of the distance; find the equation of the curve.

8. Two weights are connected by a cord hanging over a fixed pulley; find the motion, taking into account the rotation of the pulley.

9. Find the equation of motion of the centre of a cylinder, which rolls down an inclined plane without sliding.

10. Two equal bodies, attracting one another with forces varying inversely as the square of the distance, are constrained to move in straight lines at right angles to one another. Prove that they will arrive simultaneously at the point of intersection of the two lines; and find the time of reaching it.

LIGHT AND SOUND.

1. What is the *approximate* relation between the velocities of propagation of the rays of different colours, and their respective wave-lengths, according to the dispersion theory of Cauchy?

2. How are the lengths of the waves determined experimentally by means of the phenomena of gratings?

3. How is it proved by experiment that half an undulation is lost by reflexion, at the surface of a denser medium?

4. Describe M. Jamin's method of determining the refractive indices of transparent media; and deduce the formula employed.

5. Common light is incident on the surface of a transparent medium at the polarizing angle; express the intensity of the reflected light in terms of the refractive index.

6. Show that Arago's law, connecting the quantities of polarized light in the reflected and transmitted pencils, is a consequence of Fresnel's theory of reflexion.

7. Describe M. Jamin's method of determining experimentally the intensity of light reflected from metals at different incidences.

8. How is the difference of phase of the two components of the reflected pencil found?

9. When a polarized ray is diffracted by a grating, deduce the relation between the planes of vibration in the incident and diffracted pencils.

10. What is the relation between the velocities of the ordinary and extraordinary rays in biaxial crystals?

11. What is the law of rotation of the plane of polarisation of a ray which traverses a plate of rock-crystal in the direction of its axis?

12. Prove that the velocity of sound in air is independent of the pressure.

13. How does the velocity vary with temperature?

14. What is the relation between the velocity of sound in a prismatic or cylindrical body, and in an indefinite mass of the same substance?

15. What is the relation in the number of vibrations constituting the harmonic sounds? and why are these sounds so called?

ELECTRICITY.

1. What is the relation between static and current electricity, according to Faraday?

2. How is it proved experimentally that the resultant of all the forces exerted by an electrified conductor upon an interior point = 0?

3. Deduce the law of accumulation on a plate connected with a source of electricity, and opposed to a second plate in connexion with the Earth.

4. Describe the fundamental experiment of Faraday on electric induction.

5. What is M. Pouillet's method of producing a constant current?

6. Describe his method of comparing the conductivity of metals and liquids.

7. What is the conductivity of concentrated solution of sulphate of copper, compared with that of platinum?

8. How is the resistance of the voltaic pile determined experimentally?

9. Prove that a single current, whose parts are inclined to one another, tends to become straight.

10. What is the fundamental distinction between magnetism and electricity?

11. How is the law of distribution of free magnetism in a magnet ascertained experimentally?

12. What was the conclusion of Coulomb as to the law of magnetic distribution in long magnets?

13. Show that Biot's law of electro-magnetic action is a consequence of the fundamental law of Ampère.

14. Find the moment of the force exerted by a vertical conducting wire of indefinite length upon a horizontal magnet moveable on a fixed point.

15. How should the wire be placed so that the directive force may vanish, and the magnet rest in every position?

16. How would you produce a continued rotation of a conducting wire by the action of the Earth's magnetism?

PROFESSOR GALBRAITH.

THEORY OF HEAT.

1. As the foundation of all calculations of the weight and volume of gases, according to the centrigade thermometer and metrical scale, it is necessary to establish a formula for the weight of a gas or vapour in terms of its volume, pressure, and density. Prove the following:—

$$W(\text{grammes}) = 0.4645 \times \frac{V(\text{litres}) \times p(\text{millimetres}) \times \text{density}}{273 + t^\circ(\text{C})}.$$

N. B.—Regnault has determined the weight of a litre of air at 0°C . and 760mm to be 1.293187 grammes.

2. State the details of the method proposed by Dumas for finding the density of a vapour, and prove that the density may be calculated from the following equation:—

$$s = \frac{V}{V'} \frac{273 + T}{273 + t} + 2153 (W' - W) \frac{273 + T}{V'p};$$

V = volume in cubic centimetres corrected for residual bubble at $t^\circ(\text{C})$.

V' = do. at $T^\circ(\text{C})$.

$W' - W$ = difference of weight in grammes.

3. Find the density of vapour of camphor from the following experiment of Dumas:—

Temperature of air = $13.5^\circ(\text{C})$.

Height of barometer = 742 millimetres.

Temperature of bath when the globe is sealed = $244^\circ(\text{C})$.

Increase of weight = 0.708 grammes.

Volume of mercury = 295 cubic centimetres.

Bubble of air = 0 .

4. Compute the combining volumes in Litres at 0°C , 760^{mm} of oxygen, hydrogen, sulphur, and phosphorus, assuming the atomic weights in Grammes on the oxygen scale :—

Density of oxygen = 1.1057.

„ hydrogen = 0.0692.

„ vapour of sulphur = 6.617.

„ vapour of phosphorus = 4.355.

5. The capacity of air for heat under constant pressure is to that under constant volume as 1421 : 1000 ; and to that of water, weight for weight, as 238 : 1000. From these numbers deduce the mechanical equivalent of heat.

In order to consider this question conveniently, imagine a cubic mètre filled with air at 0°C . and 760^{mm} ; apply sufficient heat to double its volume under the same pressure ; apply sufficient heat to raise it to the same temperature under the same volume. Compare these quantities, and the effects produced.

6. Show how to reduce the last result in kilogrammètres, corresponding to a French unit of heat, to foot-pounds corresponding to an English unit.

7. Explain the phenomenon of the trade-winds.

8. Explain the construction and principle of Colonel Colby's compensating bar for measuring base lines in a geodetic survey.

9. Explain the principle of Borda's measuring bar for the same purpose. If L be the total length of bar, p the coefficient of expansion of platinum, m the number of divisions on the platinum bar, and n the number of divisions corresponding to the advance of the zero on the brass bar, prove that

$$L' = L \left(1 + \frac{n}{m} p \right).$$

10. What weight of vapour is contained in 50 Litres of half-saturated air at the temperature 15°C . ($f = 12.7^{\text{mm}}$) ?

CHEMISTRY.

1. Explain the principle of Leblanc's method of obtaining carbonate of soda from sea-salt.

2. State the results of Gay-Lussac's investigation of the action of nitric and muriatic acids on each other, and of their mixture on the precious metals.

3. Describe in full the process for extracting pure bromine from the mother-liquor of sea-water.

4. Give the eudiometric process for the analysis of ammonia. Deduce its composition by volume, and by weight, and also its atomic constitution.

Density of hydrogen = 0.0692.

Density of nitrogen = 0.9713.

5. In what way was the equivalent of fluorine determined to be 19

6. In order to determine the equivalent of zinc, Jacquelin measured the volume of hydrogen generated by the action of dilute acid on pure zinc, and found that 10 grammes of the metal gave 3.588 litres of gas at 0°C . and 760^{mm}. From this determine the equivalent of zinc.

7. A substance containing protoxide and peroxide of iron is completely reduced by a stream of dry hydrogen at an elevated temperature. If b grains of water be obtained as the result of the oxidation of the hydrogen, and a grains of iron from the reduction of the oxides, calculate how much of each oxide is contained in the substance.

8. As an example of the foregoing, 27.3 grains of Dannemora ore was submitted to the process; the water and iron obtained were found to be 5.60 grains and 13.25 grains, respectively; calculate the percentage of each oxide, and the chemical constitution of the ore.

9. Explain the principle of Dr. Penny's volumetric process for estimating the peroxide and protoxide of iron in a given specimen, by means of a solution of bichromate of potash. How is the standard solution made?

10. Explain Margueritte's process by means of the chameleon solution. How is the standard solution made, and its strength tested?

11. It is assumed in theoretical chemistry that the density of the vapour of carbon is 0.8293; on what grounds does this assumption rest?

12. In what way does the density of the vapour of a volatile substance control its analysis? Give an illustration.

13. How is bromine determined in a mixture of bromine and chlorine?

14. What is the constitution of silico-fluoric acid? How is it prepared? How does it behave with alkaline bases?

15. The following indirect way has been proposed of estimating separately the alkalies in a mixture of potash and soda:—Reduce the alkalies to the state of sulphates, precipitate the acid as sulphate of baryta; if r be the quotient of the weight of the sulphates of the alkalies by that of the sulphate of baryta, prove that

$$\text{Sulphate of potash (per cent.)} = 543.7 - 331.1 \times r.$$

$$\text{Sulphate of soda, } ,, = 331.1 \times r - 443.7.$$

CRYSTALLOGRAPHY AND MINERALOGY.

1. There are only five regular solids, bounded by equal, equilateral, and equiangular faces; prove this, and state which of these regular solids occur in nature as crystals.

2. As the surface of the dodecahedron is to the surface of the icosahedron, so is the side of the cube to the side of the icosahedron, inscribed in the same sphere?

3. In a given octahedron to inscribe a cube.

4. If an octahedron be inscribed in a cube, prove that the rhombic axes of the cube divide equally and at right angles the sides of the octahedron; and that the octahedral axes of the cube pass through the centres of gravity of the faces of the octahedron, at right angles to them.

5. If the notation of the faces of the triakisoctahedron be $(1, 1, n)$; show that the dihedral angles, measured over the longer and shorter edges, are

$$\cos \theta = \frac{2n^2 - 1}{2n^2 + 1},$$

$$\cos \phi = \frac{n(n+2)}{2n^2 + 1}.$$

6. In the dimetric system, the ratio of the unique axis of Idocrase to each of the equal axes is the tangent of $28^\circ 9'$; find the dihedral angles of its primitive octahedron.

7. If the faces of the dihexagonal prism of the Beryl be $(1, \frac{1}{2}, \infty)$; show how it may be constructed geometrically.

8. Andalusite has been observed to occur in rhombic prisms, having the longitudes of the poles of their faces equal to $45^\circ 22'$ and $63^\circ 44'$; deduce from these data the ratio of two of its parameters.

9. The faces of the trimetric octahedron are represented by (a, b, c) ; find the dihedral angles they make with each other, and classify them.

10. If, in the monoclinic system, whose angle is ϕ , c denote the parameter at right angles to the plane of the oblique parameters a and b ; find in the primitive octahedron the following angle—

$$(a, b, c) \quad (a, b, -c).$$

11. State the chemical formula of Beryl, and mention the localities in which it has been found in Ireland.

12. What are Rutile, Anatase, and Brookite, and where are they found in the British Islands?

13. What is the composition of Killinite, and what is its relation to Spodumene?

14. What are the feldspars and micas that have been proved to occur in Irish Granites; and mention the localities in which each species is found?

15. What are Kyanite and Scapolite, and where are they found in the British Islands.

LOGICS.

DR. MOORE.

1. State the objects and instruments of psychological investigation.

2. Give Locke's account of Abstraction and Generalization. How far are his conclusions adopted by Cousin?—and what is Cousin's distinction between immediate and comparative Abstraction?

3. Neither our knowledge of the qualities nor substratum of bodies is a comparative judgment?

(a). Show that this is admitted by Locke.

4. Give Berkeley's argument for the existence of spiritual substance.

5. Locke's theory of the knowledge of real and personal existence involves a parallogism, according to Cousin?

6. Berkeley's argument against external material existence is not fairly stated by Cousin; the premises contain more than is necessary for the conclusion?

(a). Cousin shows that "the principle of substance" is not derived from association?

7. Locke gives his principal argument on the nature of essences in the form of a Sorites; resolve this Sorites into syllogisms of the first figure.

8. By what propositions does Locke conclude against an "à priori" knowledge of the properties of substances?

(a). We may derive legitimate conjecture even beyond experience?

(b). Give Locke's examples of this.

9. In discussing the origin of our Ideas, what is Locke's proposition concerning Relations?—and give the general argument by which he proposes to establish it.

10. Show by what steps Archbishop Whately, in the analytical outline, comes to the Dictum of Aristotle.

Classics.

GREEK POETS.

DR. INGRAM.

Translate the following passages into English:—

1. *Beginning*, ὡς δ' ὅτ' ἀνὴρ ὀχετηγὸς ἀπὸ κρήνης μελανύδρου, κ. τ. λ.
Ending, λάβρος, ὕπαιθα ῥέων, κονίην δ' ὑπέρεπτε ποδοῖν.

HOMER, *Iliad*, xxi. 257-271.

2. *Beginning*, αὐτὰρ ἱπὴν μνηστῆρας ἐνὶ μεγάροισι τεοῖσιν, κ. τ. λ.
Ending, ὀλβιοὶ ἴσσουνται· τὰδε τοὶ νημερτεῖα εἶρω.

HOMER, *Odyssey*, xi. 119-136.

3. *Beginning*, τόδε θαῦμ' ἔχει με, κ. τ. λ.
Ending, ἀνύσειε γαστρὶ φορβάν.

SOPHOCLES, *Philoctetes*, 687-712.

4. *Beginning*, καὶ πρῶτα μὲν δειλαιοσ, ἴλεψ φρενὶ, κ. τ. λ.
Ending, κρατὸς διασπαρέντος, αἱματός θ' ὁμοῦ.

SOPHOCLES, *Trachiniae*, 765-784.

5. *Beginning*, ὦ ψάμαθοι πολιτήτιδος ἀκτᾶς, κ. τ. λ.
Ending, πέμπετε τῶνδ' ἀπ' οἴκων;

EURIPIDES, *Hippolytus Coronifer*, 1124-1145.

6. *Beginning*, ὦ πολύξεινος, καὶ ἐλευθέρος, κ. τ. λ.
Ending, χαίρουσ' εὐφρόνι μολπᾷ.

EURIPIDES, *Alcestis*, 585-603.

DR. LUBY.

Translate the following passages into English :—

1. *Beginning*, Πρὸς τοῦτοις τοίνυν τηλικούτοις οὖσιν, κ. τ. λ.
Ending, σφαλερωτέραν αὐτῷ πεποίηκε.
 DEMOSTHENES, *In Epistolam Philippi*.
2. *Beginning*, Ἐκ τούτου δὴ ὥχοντο ἐπὶ τὰς σκηνάς, κ. τ. λ.
Ending, Καὶ ὁ Κῦρος μὲν δὴ οὕτω περὶ τούτων ἐγίνωσκεν.
 XENOPHON, *Cyropædia*, lib. v.
3. *Beginning*, Καὶ ἡ μὲν γνώμη κοινωνεῖτω, κ. τ. λ.
Ending, ὥς μὴ ἀπολείπεται τῆς φορᾶς.
 LUCIAN, *De Conser. Hist.*
4. *Beginning*, Μάλιστα δὲ κατόπτρῳ τοικυῖαν παρασχίσθω, κ. τ. λ.
Ending, καὶ ἱρρύθμιζον, καὶ ἐπήνθιζον τῷ χρυσῷ.
 LUCIAN, *Ibid.*

MR. STACK.

Translate the following passage into Greek Prose :—

- Beginning*, And now, on the news respecting Eubœa reaching the Athenians, ...
Ending, contested against them with the greatest success.
Translation of Thucydides.

GREEK VERSE COMPOSITION.

DR. INGRAM.

Translate the following passage into Greek Trimeter Iambics :—

- Beginning*, Pylades. Where is she? that my words with speed may tell . . .
Ending, The precious burden!
 MISS SWANWICK, *from* GOETHE.

DR. GRAVES.

Translate the following passages into English :—

1. *Beginning*, Ac velut, effusa si quando grandine nimbi.
Ending, Per medium Æneas juvenem; totumque recondit.
 VIRGIL, *Æneid*, lib. x. 803-816.
2. *Beginning*, Nec pingues unam in faciem nascuntur olivæ.
Ending, Tmolus et assurgit quibus et rex ipse Phænæus.
 VIRGIL, *Georg.*, lib. ii. 85-98.
3. *Beginning*, Geta. Hem! A. Quid egisti? G. Emunxi argento senes. . . .
Ending, Quin male narrando possit depravarier.
 TERENCE, *Phormio*, act iv. sc. 4.

4. *Beginning*, Pi. Multi more isto atque exemplo vivunt, quos quom censeas
Ending, Facere, et in me inconciliare copias omnes meas.
 PLAUTUS, *Bacch.*, act. iii. sc. 6.
5. *Beginning*, An magis oblectant animum jactata petauro
Ending, In pelago.
 JUVENAL, *Sat.* xiv. 265-277.
6. *Beginning*, Solis natalibus est qui
Ending, Seu ceraso peccent casiae, nescire paratus.
 PERSIUS, *Sat.* vi. 19-36.

MR. STACK.

Translate accurately the following passages :

1. *Beginning*, Redeo ad altercationem. Surgit pulchellus puer :
Ending, ἐπισημασίας sine ulla pastoricia fistula auferebamur.
 CICERO, *Ep. ad Att.*, i. 16.
2. *Beginning*, Si quid in te peccavi, ac potius quoniam peccavi, ...
Ending, nocere omnino nobis non potuisset.
 CICERO, *Ep. ad Att.*, iii. 15.
3. *Beginning*, At enim solidum id est ut me Siculi maxime velint :
Ending, se in judiciis diutius dominari non posse.
 CICERO, *in Verr. Divin.*
4. *Beginning*, Teneo, teneo, inquam, in mediis vectigalibus
Ending, expectatum existimationis tuæ judicium : non facis.
 CICERO, *in Verr.*
5. *Beginning*, Ac ne bello quidem Italico, mox civili omissum, ...
Ending, plerique legis nexus modicum in præsens levamentum fuere.
 TACITUS, *Ann.*, iii. 28.

DR. LUBY.

Translate the following passage into Latin Prose :—

- Beginning*, To touch but for a moment on one other subject
Ending, we may hope that the dawn of the morning is but the nearer.
 BROWNE, *Aids to Faith—Inspiration.*

DR. GRAVES.

Translate the following passage into Latin Elegiacs :—

- Beginning*, And is there care in Heaven? And is there love
Ending, O, why should heavenly God to men have such regard?
 SPENSER, *Faery Queen*, book ii. canto 8.

GRECIAN AND ROMAN HISTORY.

DR. INGRAM.

1. Some writers have regarded the Lyncurgen system as representing the common type of Dorian institutions. Do you consider this view a correct one?

2. In what respects did the Periclean constitution at Athens differ from that of Cleisthenes?

3. Write a note on the distinguishing characters of Grecian, Roman, and modern colonization.

4. In what transactions of Grecian political history do the names of these eminent writers appear:—Hecataeus, Polybius, Sophocles, Thucydides, Tyrtaeus?

5. Describe briefly and accurately the condition of the several states of Greece when Philip of Macedon ascended the throne.

6. State the essential facts of Roman history during the Regal period, as (it is supposed) they may be elicited from the legends.

7. What were the principal enactments, of a progressive character, contained in the Decemviral Code?

8. What were the several changes successively made in the constitution of the Roman *judicia*?

9. When, and how, did the following countries become Roman provinces:—Spain, Sicily, Sardinia, Cilicia, Syria, Numidia?

10. Write short notices of—*a.* Spurius Cassius; *b.* C. Flaminius; *c.* C. Quinctius Flaminius; *d.* L. Æmilius Paullus the Younger.

11. Give a full account of the family of Augustus.

12. Write down the ancient names from which the following are derived:—Amiens, Auvergne, Bourges, Fréjus, Grenoble, Nismes, Treves, Utrecht. Also the modern names of the places known in ancient times as Avaricum, Bibracte, Genabum, Hispalis, Interamna, Præneste, Saguntum, Tusculum.

MR. STACK.

1. In comparing Homer and Virgil, state the influences which had affected the subject matter and the form of epic poetry in the interval between them, and point out the bearing of these upon the comparison.

2. Mr. Conington disposes of many of the disparaging criticisms on the *Æneid* by stating what he conceives to be the true relation between Homer and Virgil?

3. Analyze the character of *Turnus* in its connexion with the leading idea of the epic of Virgil.

4. Compare the *female* characters of the *Iliad* and the *Æneid*, and account for the difference of type observable in them.

5. "Eumenidum veluti demens videt agmina Pentheus
Et solem geminum et duplicis se ostendere Thebas
Aut Agamemnonius scænis agitatus Orestes."

The reference to the *stage* in these lines has been made a subject of objection; discuss it.

6. Mr. Grote points out what he conceives to be the "great innovation of the Athenian dramatists;" trace the intellectual and literary effect which this change must have produced.

7. State the probable origin of Tragic *Trilogies*, and the cause of their discontinuance.

8. What is the true conception of the Satyric Drama?

9. Give an account and examples of the *vocabulary* of the Satyric Drama.

10. The Satyric Drama seems to be opposed to a well-known feeling of the Greeks?

11. Describe with some fulness of illustration the two forms of Greek style called by Aristotle, *εἰρομένη λέξις* and *συνεστραμμένη λέξις*.

12. Note the forces of the pronouns *ὅδε* and *οὗτος*, which, employed in Classic Greek, were lost in the Greek of a later date.

13. Describe with grammatical precision the relations expressed severally by the genitive, dative, and accusative *cases* in Greek.

14. State the grounds on which it is maintained that the Greek *tenses* do not primarily imply *time*.

15. The Greek preposition is defined as expressing *local geometrical relation*; develop this statement.

16. Compare the Greek and Latin forms for the *comparative* and *superlative*, and illustrate them by reference to the analogous forms in Sanscrit.

17. Write a note on the traces of the *locative case* in Greek and Latin.

18. Explain, with reference to a *locative case*, the ordinary rule for the cases in Latin in which is expressed the answer to the question—*where*?

19. The formation of *conjunctions* offers a good example of the operation of general laws in the Indo-Germanic family of languages.

20. οὐδὲ γὰρ ξυμπάσῃ τῇ στρατιᾷ δυνάμεθ' ἂν χρήσασθαι.

The reading here appears to be faulty; state the reason why, and make the correction.

21. The meanings of *ὑπάρχειν*—*εἶναι*—*γίγνεσθαι* are all expressed by the English verb substantive; distinguish the shades of meaning.

22. Write a note on the distinction of the meanings of *εἰπίσταμαι*—*εἰδέναι*—*γινώσκω*.

23. καὶ δὴ μεθύων

ἄχαριν κελαδὸν μουσιζόμενος
σκαῖδς ἀψφδὸς καὶ κλαυσόμενος
χωρεῖ.

EURIP. *Cycl.*

Translate these lines, so as to bring out the full significance of the words used.

24. συνεκθανεῖν σιγῶντα χρή τῷ πώματι.—EURIP. *Cycl.*

Translate this verse, and write a note on the word *εκθνήσκω*.

25. Translate the following words from the Iphig. in Taur. :—

a. κάμοι γάρ τι προὔφειλει κακόν.

b. πίπτει δὲ μανίας πίτυλον ὁ ξένος μεθείς.

c. ἦν τις διαρρώξ κυμάτων πολλῶ σάλψ
κοιλωπὸς ἀγμὸς, πορφυρεντικαὶ στέγαι.

26. τὰ τελευταῖα δ' ἐναγχος ἐν χορηγίοις ἀλλοτρίοις ἐπὶ τῇ τριταγωνιστεῖν ἀγαπητῶς παρατρεφόμενον.—DEMOSTHENES, *De Fals. Log.*

Translate *accurately* the above passage.

27. αὐθαίρετον αὐτοῖς ἐπάγονται δουλείαν, Φιλίππου ξενίαν καὶ ἑταιρίαν καὶ φιλίαν καὶ τοιαῦθ' ὑποκοριζόμενοι.—DEMOSTHENES.

Translate these words, and write a note on the word ὑποκοριζόμενοι.

28. Write a note on the *biographical* tendency of the historians under the Roman Empire.

29. The absence of the *critical* spirit among the Romans in writing history presents a strong contrast to their practice in another department of literature.

30. Merivale draws an interesting comparison between the writings of Tacitus and Juvenal; state the chief points in his view.

LOGIC.

DR. MOORE.

1. If the comprehension of one Idea be part of the comprehension of another, the extension of the latter will be part of the extension of the former. Prove this rule, and show how it is applied to the relative affections of propositions.

2. Define a predicamental line; and, taking the term "proposition" as the genus, write out *the line* with its species.

3. What criterion of a good definition does Murray propose? How far would this agree with the office of Logic in definition, as given by Archbishop Whately?

4. Prove the special rules of the first figure from Aristotle's dictum; and state the principal objections made to this dictum.

5. Taking the four propositions, A, E, I, O, successively as conclusion, deduce the legitimate modes.

6. Archbishop Whately shows what classes of arguments will naturally fall into the first three figures severally?

7. In *Reductio ad impossibile* what premiss is to be suppressed in the second and third figures, respectively?—and prove that the result will give the conclusion of the reduct contradictory of the omitted premiss.

8. Define the species of Sophism "*petitio principii*," and explain its subdivisions as given by Archbishop Whately.

EXAMINATION FOR SANSKRIT PRIZES.

SENIOR CLASS.

DR. LOTTNER.

TRANSLATIONS.

1. Translate into English (Mahābhārata):

Marks, 15.

दुर्योधन उवाच

किमर्थं भरतश्रेष्ठ नैव हन्याः शिखण्डिनम् ।
 उद्यतेषुमथो दृष्ट्वा समरेष्वाततायिनम् ॥
 पूर्वमुक्त्वा महाबाहो पाञ्चालान्सह सोमकैः ।
 हनिष्यामीति गाङ्गेय तन्मे ब्रूहि पितामह ॥

भीष्म उवाच

शूण दुर्योधन कथां सहैभिर्वसुधाधिपैः ।
 यदर्थं युधि सम्प्रक्ष्य नाहं हन्यां शिखण्डिनम् ॥
 महाराजो मम पिता शान्तनुर्लोकविश्रुतः ।
 दिष्टान्तमाप धर्मात्मा समये भरतर्षभ ॥
 ततो ऽहं भारतश्रेष्ठ प्रतिज्ञाम् परिपालयन् ।
 चित्राङ्गदं भ्रातरं वै महाराज्ये ऽभ्यषेचयम् ॥
 तस्मिंश्च निधनं प्राप्ते सत्यवता मते स्थितः ।
 विचित्रवीर्यं राजानमभ्यषिञ्चं यथाविधि ॥

मयाभिषिक्तो राजेद्र यवीयानपि धर्मतः ।
 विचित्रवीर्यो धर्मात्मा मामेव समुदैक्षत ॥
 तस्य दाराक्रियां तात चिकीर्षुरहमप्युत ।
 अनुरुपादिव कुलादित्येव च मनो दधे ॥
 तथाश्रौषं महाबाहो तिस्रः कन्या स्वयंवराः ।
 ह्रुपेणाप्रतिमाः सर्वा काशिराजसुतास्तदा ॥
 अस्त्रां चैवास्त्रिकां चैव तथैवास्त्रालिकामपि ।
 राजानश्च समाहूता पृथिव्यां भरतर्षभ ॥

2. Translate into English (Bhagavad-gita):

Marks, 15.

कर्मण्यकर्म यः पश्येदकर्मणि च कर्म यः ।
 स बुद्धिमान् मनुष्येषु स युक्तः कृत्स्नकर्मकृत् ॥
 यस्य सर्वं समारम्भाः कामसंकल्पवर्जिताः ।
 ज्ञानाग्निदग्धकर्माणं तमाहुः पण्डितं बुधाः ॥
 त्यक्त्वा कर्मफलासङ्गं नित्यतृप्तो निराश्रयः ।
 कर्मण्यभिप्रवृत्तो ऽपि नैव किञ्चित् करोति सः ॥
 निराशीर्यतचित्तात्मा त्यक्तसर्वपरिग्रहः ।
 शरीरं केवलं कर्म कुर्वन्नाप्नोति किल्बिषम् ॥
 यदृच्छालाभसंतुष्टो बन्धातीतो विमत्सरः ।
 समसाङ्गवसिष्ठौ च कृत्वापि न निबध्यते ॥

3. Translate into English (Panchatantra):

Marks, 15.

अथ कस्मिंश्चिन्नोद्देशे मदोत्कटो नाम सिंहः प्रति वसति । तस्य चानुचरा द्वीपिवा-
यसगोमायवः सन्ति । अथ कदाचित्त्रैरितस्ततो
भ्रमद्भिः सार्थभ्रष्टः क्रथनको नामोष्ट्रो दृष्टः ।
अथ सिंह अहं अहो अपूर्वमिदं सत्त्वम् ततो
ज्ञायतां किमेतदारण्यमुत ग्राम्यं वेति । तच्छ्रुत्वा
वायस आह भो स्वामिन्याम्यो ऽयमुष्ट्रनामा
जीविविशेषस्तव भोज्यः तद्वापाद्यताम् । सिंह
आह । नाहंगृहागतं हन्मि । उक्तं च ।

गृहे शत्रुमपि प्राप्तं विश्वस्तमकुतोभयम्
यो हन्यात्तस्य पापं स्याच्छतब्राह्मणघातजम् ॥
तदभयप्रदानं दत्त्वा मत्सकाशमानीयतां येना-
स्यागमनकारणं पृच्छामि ।

4. Translate into English (Bhartṛhari):

Marks, 10.

प्रीणाति यः सुचरितैः पितरं स पुत्रः
यद्गर्तुदेव हितमिच्छति तत्कलचम् ।
तन्मित्रमापदि सुखे च समक्रियं य-
देतत्त्रयं जगति पुण्यकृतो लभन्ते ॥

आरम्भगुर्वी क्षयिणी क्रमेण
लघ्वी पुरा वृद्धिमती च पश्चात् ।

दिनस्य पूर्वार्धपरार्धभिन्ना छायेव मैत्री खलसज्जनानाम् ॥

5. Translate into Sanskrit :

Marks, 20.

There dwell in a certain dominion two friends, by name Virtuous-mind and Sinful-mind. Then once upon a time Sinful-mind thought : I am now a fool tormented by poverty. Therefore, taking this Virtuous-mind, going to another region, gaining wealth by his help, and cheating him, I shall be fortunate. On another day he said to Virtuous-mind : O friend, since you are not yet old, why do you muse (remember) upon your own acts? Having not seen another country, what tale will you tell to

the young people (शिशुजन)? For it is said—

Knowledge, wealth, power, a man does not obtain, as long as he does not roam on the earth from one region to another region in joyous mind.

PHONETIC RULES.

Marks, 25.

1. State which letters are sonants.
2. State to which of the five classes of letters the sibilants and semi-vowels belong respectively.
3. Whence is the **ण** in **क्रमेण**? State clearly the rule on the change of **न** to **ण**.
4. Join **स** "this one," in sandhi with **उवाच, अस्ति**. Do the same with **सा**.
5. What happens when **न** at the end of a word is followed by a sibilant? Give examples.
6. Join

नरा : and अभवन्
पुनर् and रमते
प्रातर् and तम्
रमते and अच
नारी and आह
इह and ऋषि :

7. What is the name of the sign ॐ, and how is it employed?
8. When do roots ending in a sonant aspirate throw the aspiration on the beginning consonant of the suffixes? Give examples.
9. What becomes of ह when final? Give examples.
10. Give instances in which final vowels are not subject to sandhi.

GRAMMATICAL QUESTIONS.

1. Decline पथिन्, विद्वस् msc., अप्, गो, giving their signification.
2. Decline स बलवान् अश्वः with sandhi.
3. State wherein सर्व differs in declension from यत्
4. Give the genitives of the numerals 2-10 in all their genders.
5. State the names of the 6 classes of compounds, and give examples.
6. Give one example of each of the ten verbal classes in the second person singular and plural parasmai.
7. State the common characteristics of the six classes as contrasted with the four.
8. In the first extract there occurs an aorist. Point it out, state which formation it is, and conjugate it through, parasmai and ātmanē.

COMPARATIVE PHILOLOGY.

1. State the meaning of the three Sanskrit roots विद्, their present tense, and their connection with each other and with the classical languages.
2. What is the origin of the infinitive in तुम् and the gerund in त्वा? What corresponds to them in Greek and Latin?
3. What is the meaning of the words निधन, सङ्ग्राम and याम, दम् (Vedic), and how does the Greek throw light on these Sanskrit words?
4. What are the representatives of Sanskrit प, भ, त, द, ध, in English? Give examples.
5. Point out words in English cognate with उद, वाञ्छ, वर्ण, मृदु, प्रिय.

LITERATURE AND MYTHOLOGY.

1. What is the oldest god of the Indogermans? Show reasons why you consider him so. What are the four chief gods in the R̥gveda? What are the Lōkapālas?

2. What do you know about the origin of the Hitōpadêça?

3. State why the Mahābhārata in its present form must be later than Alexander. What are the names of the five brothers that are the heroes of it? Give their signification. Who was Karna?

4. State what you know of the history of Sanskrit philology. Show its threefold importance with regard to the practical management of Indian affairs; with regard to ancient history in general; with regard to linguistical science and ethnology.

[N. B.—The last question, if correctly, but briefly answered, will count only 4. According to the more or less details of accurate information, the number will be extended.]

Total, 220

JUNIOR CLASS.

1. Translate into English (Nala):

Marks, 20.

श्रुत्वा वचः सुदेवस्य ऋतुपर्णो नराधिपः ।
 सान्त्वयन् प्रियया वाचा वाहुकं प्रत्यभाषत ॥
 विदर्भां यातुमिच्छामि दमयन्त्याः स्वयंवरं ।
 एकाहना हयतत्त्वज्ञं मन्यसे यदि वाहुक ॥
 एवमुक्तस्य कौन्तेय तेन राज्ञा नलस्य ह ।
 व्यदीर्यत मनो दुःखात्प्रदध्यौ च महामना ॥
 दमयन्ती वदेदेतत्कुर्याद्दुःखेन मोहिता ।
 अस्मदर्थे भवेद्वा ऽयमुपायश्चिन्तितो महान् ॥
 नृशंसं वत वैदर्भीं कर्तुकामा तपस्विनी ।

मया क्षुद्रेण निहता कृपणा पापबुद्धिना ॥
 स्त्रीस्वभावश्चलो लोके मम दोषश्च दारुणः ।
 स्यादेवमपि कुर्यात्सा विवासान्नतसौहृदा ॥
 मम शोकेन संविग्ना नैराश्यात्तनुमध्यमा ।
 नैवं सा कर्हिचित्कुर्यात्सापत्या च विशेषतः ॥

2. Translate into English (Hitôpadêça) :

Marks, 20.

हिरण्यकश्चिचाङ्गलघुपतनकाबाह । यावदयं
 व्याधो वनात् निःसरति तावन्मन्थरं मोच-
 यितुं यत्नः क्रियताम् । तावूचतुः । सत्वरं यथा-
 कार्यमुपदिश । हिरण्यको ब्रूते । चिचाङ्गो
 जलसमीपं गत्वा मृगमिव आत्मानं निश्चेष्टं
 दर्शयतु । काकश्च तस्योपरि स्थित्वा चञ्च्वा
 किमपि लिखतु । नूनमनेन लुब्धकेन मृगमां-
 सार्थिना तत्र कच्छपं परित्यज्य सत्वरं गन्तव्यम् ।
 ततो ऽहं मन्थरस्य बन्धनं छेत्स्यामि । ततश्चिचा-
 ङ्गलघुपतनकाभ्यां शीघ्रं गत्वा तथानुष्ठिते सति
 स व्याधः परिश्रान्तः पानीयं पीत्वा तरोरध-
 स्तादुपविष्टः सन् तथाविधं मृगमवलोक्य
 कच्छपं जलसमीपे निधाय कर्त्तरिकामादाय
 प्रहृष्टमना मृगान्तिकं चलितः । अचान्तरे

हिरण्यकेनागत्य छिन्नबन्धनः स कूर्मः सत्वरं
जलाशयं प्रविष्टः ॥

3. Translate into English (Hitôpadêça):

Marks, 10.

संलापितानां मधुरैर्वचोभर्मिथ्योपचारैश्च वशी-
कृतानाम् ।

अशावतां श्रद्धतां च लोके किमर्थिनां वञ्च-
यितव्यमस्ति ॥

मृद्वटवत्सुखभेद्यो दुःसन्धानश्च दुर्जनो भवति ।

सुजनस्तु कनकघटवद्दुर्भेद्यश्चाशु सन्धेयः ॥

मनस्यन्यद्वचस्यन्यत्कार्यमन्यदुरात्मनाम् ।

मनस्येकं वचस्येकं कर्मण्येकं महात्मनाम् ॥

4. Translate into Sanskrit:

Marks, 15.

In the hollow of a tree there dwelt two cats. Where did the large cat dwell? On the branches (शाखा) of that tree many birds made their dwelling. Mice and birds are the food of cats; but deer are eaten by lions and tigers. Having heard the words of the old tiger, the traveller replied with anger: I will not do what you command me (आज्ञा caussal). The king of the mice loosened the bonds of the pigeons. Hence I say: a friend is not to be despised (अवमन्), even though he be weak (part. pres.).

PHONETIC RULES.

Marks, 25.

1. State which letters are sonants.
2. State to which of the five classes of letters the sibilants and semi-vowels belong respectively.
3. Whence is the ए in क्रमेण? State clearly the rule on the change of न to ए.

4. Join स "this one," in sandhi with उवाच, अस्ति. Do the same with सा.

5. What happens when न at the end of a word is followed by a sibilant? Give examples.

6. Join

नरा : and अभवन्
 पुनर् and रमते
 प्रातर् and तम्
 रमते and अच
 नारी and आह
 इह and क्षुषि :

7. What is the name of the sign ॐ, and how is it employed?

8. When do roots ending in a sonant aspirate throw the aspiration on the beginning consonant of the suffixes? Give examples.

9. What becomes of ह when final? Give examples.

10. Give instances in which final vowels are not subject to sandhi.

GRAMMATICAL QUESTIONS.

1. Decline पथिन्, विद्वस् msc., अप्, गो, giving their signification.

2. Decline स बलवान् अश्वः with sandhi.

3. State wherein सर्व differs in declension from यत्.

4. Give the genitives of the numerals 2-10 in all their genders.

5. State the names of the 6 classes of compounds, and give examples.

6. Give one example of each of the ten verbal classes in the second person singular and plural parasmai.

7. State the common characteristics of the six classes as contrasted with the four.

*8. Give the benedictive parasm. and âtmanê of भू, and conjugate it through.

COMPARATIVE PHILOLOGY.

1. State the meaning of the three Sanskrit roots **विद्**, their present tense, and their connection with each other and with the classical languages.
2. What is the origin of the infinitive in **तुम्** and the gerund in **त्वा**? What corresponds to them in Greek and Latin?
3. What is the meaning of the words **निधन**, **सङ्ग्राम** and **ग्राम**, **दम** (Vedic), and how does the Greek throw light on these Sanskrit words?
4. What are the representatives of Sanskrit **प**, **भ**, **त**, **द**, **ध**, in English? Give examples.
5. Point out words in English cognate with **उद**, **वाञ्छ**, **वर्ण**, **मृदु**, **प्रिय**.

LITERATURE AND MYTHOLOGY.

1. What is the oldest god of the Indogermans? Show reasons why you consider him so. What are the four chief gods in the R̥gveda? What are the Lōkapālas?
2. What do you know about the origin of the Hitōpadêça?
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[N. B.—The last question, if correctly, but briefly answered, will count only 4. According to the more or less details of accurate information, the number will be extended.]

Total, 220

EXAMINATION FOR PRIZES IN MODERN LANGUAGES.

French Language.

DR. ABELTSHAUSER.

Traduisez en Anglais :—

Beginning, Chaque étoile à son tour vient apparaître au ciel.

Ending, Qu'importe l'étoile qui tombe !

VICTOR HUGO, *Promenade—Ode vingtième*.

Traduisez en Français :—

Beginning, Our cock, which always crew at eleven, ...

Ending, "hospitality is one of the first Christian duties."

GOLDSMITH, *Vicar of Wakefield*.

I.—Traduisez en Anglais :—

- a. Bien vous prend, ma sœur, que son noble génie
N'ait pas vaqué toujours à la philosophie.
 - b. Je l'aperçois qui vient ; et sur cette matière,
Il pourra nous donner une pleine lumière.
 - c. Son Monsieur Trissotin me chagrine, m'assomme ;
Et j'enrage de voir, qu'elle estime un tel homme.
 - d. Sa réponse est une franche défaite.
 - e. C'est une franche coquette.
-

II.—Traduisez en Français :—

- a. All his teeth have fallen out.
 - b. The wiser a man (*on*) is, the more indulgent he is to the fail-
ings of others.
 - c. Although he came into a good property, he is none the richer
for it.
 - d. Covered with flowers. Filled with envy. To enjoy life.
[Donnez la règle pour l'emploi de la préposition dont vous
vous servirez.]
-

III.—a. Quand doit-on se servir de *pas* devant *plus*, et quand doit-on
l'omettre ?

b. De quel nombre doit être le Verbe après les sujets suivants : un peuple de sauvages—la plupart des gens—une foule de pauvres—toute sorte de livres. [Donnez la règle pour votre réponse.]

IV.—a. Dites la signification et la dérivation de :

Lien, lieue ; sein, sain, seing, ceint, saint, cinq ; ver, vera, vert, verre, vair ; le pendule, la pendule ; le période, la période ; un aigle, une aigle ; un trompette, une trompette ; le garde, la garde ; comte, compte.

b. La différence entre : un garde du corps et un corps de garde, quoique et quoi-que, plutôt et plus-tôt.

V.—a. Que veut-on dire par *la Pléiade* au 16^{me} Siècle ?

b. La Vie et les œuvres de Marot ?

c. Celles de Rabelais ? Son influence sur quelques littérateurs Anglais ?

d. Dans *Hudibras* se trouvent ce vers :

He that fights and runs away,
May live to fight another day.

De quel ouvrage français provient-il ?

German Language.

DR. ABELTSHAUSER.

Translate into English :—

Beginning, Der alte Vater Martin war.....

Ending, Und scheuchte nicht den frohen Muth.

MAHLMANN, *Der Vater Martin*.

Translate into German :—

Beginning, You must know, then, that I am very well descended ;....

Ending, interpreter to Punch and King Solomon in all his glory.

GOLDSMITH, *Adventures of a Strolling Player*.

I.—Translate into English :—

a. Er kommt erst von Akademien, dünkt sich eben nicht weise, aber glaubt doch, er wisse mehr als andere.

b. Ich liess das gnt seyn.

c. Besonders macht man viel wesens von seiner ältesten Tochter.

d. Wenn ihm nur kein Unglück widerfahren ist !

II.—Translate into German :—

- a. He waited for me an hour and a half—two hours and a half.
- b. It hurts me. (Use the substantive *weh*.)
- c. He related all sorts of stories to me.
- d. What is the matter?—What is the matter with you?

III.—a. When are the particles, *durch*, *über*, *um*, *unter*, separable, and when inseparable?

b. Is *erschrecken* a strong or a weak verb?

c. Of what verbs must the infinitive sometimes be used instead of the past participle, and under what circumstances?

d. When is the German definite article used for the English possessive pronoun, and by what construction is the omission compensated? (Write a sentence as an example.)

IV.—a. What is the difference between the following words :—Wand, Mauer; Recht, Gesetz; Fräulein, Fräuchen; Frau, Weib; der Band, der Theil (*eines Buches*); der Mensch, das Mensch; Mund, Maul?

b. Write the two plurals of the following words :—Land, Band, Wort, Ding, Gesicht, Horn; and tell the difference each makes in the sense.

c. The preposition *to* may be rendered into German by *zu*, *nach*, *auf*, *an*, or by simply using the dative? State the rule for the employment of this, and of each German preposition, and what case it governs in this sense.

V.—Lessing—When did he flourish? What are his principal works? What effects did he produce on German literature?

Italian Language.

PROFESSOR MARANI.

Translate the following passages into English :—

1. *Beginning*, Aristodemo. A franco.....

Ending, Si torni in guerra.

MONTI, *Aristodemo*, act ii. sc. 7.

2. *Beginning*, Vincenzo Gioberti Torinese, sacerdote, filosofo,.....

Ending, lo lasciò correre ne' suoi Stati, onde si diffuse in tutta Italia.

BALBO, *Compendio della Storia d'Italia*.

Translate the following passage into Italian :—

Beginning, The old family mansion of the Vaughans.....

Ending, filled its airy and ample halls.

LONGFELLOW, *Kavanagh*, xvi.

QUISTIONI GRAMMATICALL.

1. L'articolo definito è mai impiegato cò nomi propri di persone, e quale ne è l'ufficio.
2. Qual parte del discorso viene spesso usato dagl' Italiani in vece del pronome possessivo?
3. Date i varii significati della particella *ne*, e dite che cosa sia, e quando debba, o no, unirsi col verbo.
4. Scrivete il superlativo assoluto dè seguenti aggettivi :—Integro, celebre, sublime, salubre : grande, splendido, cortese, e colto.
5. Qual è la costruzione del verbo quando dipendente dal pronome *chi*?
6. Scrivete il preterito dei verbi *sapere*, *sciogliere*, *credere*, *vedere* ; il participio passato di *volgere*, *potere*, *ridere*, *svellere*, *temere*, *vincere*, *seppellire*, *volere*.

QUISTIONI SULLA STORIA.

1. Chi fu il primo dei Visconti che assunse il titolo di Duca di Milano, ed in qual epoca ebbe luogo quell' evento?
2. A che epoca Lucchino Visconti s' impadronì del governo di Milano, e quali furono i nemici che gli mossero guerra e che lo costrinsero a lasciar Milano?
3. Chi fu l' ultimo della famiglia Visconti che portò il titolo di Duca di Milano, e chi gli successe?
4. All' epoca dei Visconti, qual altra grande famiglia divideva seco loro la somma influenza negli affari d' Italia?

QUISTIONI SULLA LETTERATURA.

1. Qual è la storia scritta da Caterino Davila che gli ha meritata l'immortalità?
2. Chi è l'autore del *Primato morale e civile degl' Italiani*, e quali sono le altre sue opere?
3. A che epoca visse Guiseppe Leopardi, e quali sono i suoi scritti?
4. Nominate quattro autori classici di tragedie nel XIX. secolo, e date il nome della principale composizione tragica di cadauno.

Spanish Language.

PROFESSOR MARANI.

Translate the following passages into English :—

1. *Beginning*, *D. Diego*. ¡Mandar, hija mia!.. En estas materias.....
Ending, *hallaria en V. todo cuanto yo deseaba.*
MORATIN, *El sí de las Niñas*, act ii. sc. 7.

2. *Beginning*, Yace donde el sol se pone, ...

Ending, "De los zelos y sospechas."

LOPE DE VEGA, *Canções escogidas*.

Translate the following passage into Spanish :—

Beginning, The languages which are spoken by the inhabitants

Ending, and varied it from both of those terminations.

SISMONDI, *Literature of the South of Europe*, c. i.

GRAMMATICAL QUESTIONS.

1. When is the Spanish conjunction "que" left out in that language ?
2. Write down the plural of cualquiera, and quienquiera. State their meaning, and say whether they are simple or compound words.
3. What difference is there between mio, tuyo, suyo, and mi, tu, su ? Give the meaning and construction of both forms with their corresponding plural.
4. Este, esta, esto is the demonstrative pronoun corresponding to the English pronoun "this." State why there are three forms in Spanish, and give their corresponding forms in the plural.
5. Give the present indicative of sentir, pedir, and decir; the preterite definite of tener, haber, ser, and dormir; the past participle of hacer and ver; and the present participle of poder.

QUESTIONS ON LITERATURE.

1. Besides Don Quijote, did Cervantes write any other classic work of great merit ?
2. Who is the best modern historian in Spain ? and what history did he write ?
3. What are the works of Yglesias, Iriarte, Quevedo, Martinez de la Rosa, El Padre Isla, and Lope de la Vega ?
4. At what epoch did Calderon della Barca live ? and what are his principal works ?

QUESTIONS ON HISTORY.

1. Who was the King of Spain who succeeded finally in driving the Moors out of Spain ?
2. What were the principal reasons that induced the Netherlands to shake off the Spanish yoke ; and how long did that heroic nation struggle against the powerful Spanish monarchy before conquering its independence ?
3. Under whose reign did Christopher Columbus discover America ?
4. At what epoch did Austria, and the greater part of Italy, belong to the Spanish monarchy ? and when did the King of Spain cease being the Emperor of Austria ?

EXAMINATION FOR THE DEGREE OF BACHELOR IN MEDICINE.

DR. STOKES.

Write your opinion on each of the following cases :—

1. A spastic state of the muscles of the back; retraction of the head; hyperæsthesia of the surface; spasmodic action, occasionally paroxysmal; suffusion of the eyes; anxious expression of the countenance; delirium absent; febrile symptoms doubtful; the disease not chronic, but in the locality epidemic.
2. A chronic and apyrexial disease; the entire of one side of the thorax absolutely dull on percussion; râle, bronchial respiration, and vocal resonance absent; no excentric displacement; a varicose condition of the subcutaneous veins on the affected side; long-continued but slight hæmoptysis.
3. A tumour in the upper part of the abdomen, distinctly but feebly pulsating; it is moveable vertically and transversely; it presents bellows murmur, which, however, disappears in certain positions of the tumour.
4. A pustular eruption; each pustule surrounded by a white areola; sanious discharge from the nostrils; patches of a livid œdema on the face; low typhoid fever; death; the lungs presenting small purulent deposits, each of them surrounded by circumscribed ecchymoses.
5. Occasional attacks of syncope; pulse slow; attacks of syncope followed often by a passing hemiplegia without muscular contraction.

ANATOMY AND PHYSIOLOGY.

PROFESSOR M'DOWEL.

1. Describe the minute structure of muscle, and contrast the microscopic appearances of muscular fibre in repose and in active contraction.
2. Enumerate the openings into the superior, middle, and inferior meatuses, respectively.
3. Describe the dissection necessary to expose the conjoined tendons of the internal oblique and transversalis abdominis muscles.
4. Enumerate the muscles which connect the scapulæ to the trunk, and assign to each its action.
5. The course and relations of the ulnar artery in the forearm.
6. What are the "*arteriæ helicinæ*," and who described them?

1. Describe the minute anatomy of the lung, and the arrangement of the pulmonary capillaries.
2. Describe the Eustachian valve, and assign its functions.

3. Describe the recto-vesical fascia, and the dissection you would make to demonstrate it.
4. Describe the quadrigeminal bodies. What are their homologues in reptilia and fishes?
5. Trace the circumflex humeri nerve, and mention its distribution.

SURGERY.

PROFESSOR SMITH.

1. What are the distinctive characters of venereal iritis? Mention the different diseases during the progress of which iritis may occur. In what cases is bark useful? Who recommended turpentine in this disease? What is your opinion respecting bleeding in cases of iritis?
2. Describe Dupuytren's operation for the cure of an artificial anus, and Amussat's for the establishment of one.
3. Mention the different forms of intussusception, and the process by which a natural cure is occasionally accomplished.
4. Describe Nélaton's mode of reducing a dislocation of the lower jaw.
5. What dangers attend deep-seated abscess in the axilla?

PRACTICE OF MEDICINE.

DR. BANKS.

1. Enumerate the causes which induce anæmia.
2. The causes, the symptoms, the pathology, and the treatment of gangrene of the lung?
3. Give the symptoms, diagnosis, and treatment of acute peritonitis.
4. The symptoms, the progress, and the terminations of diphtheritic paralysis.

INSTITUTES OF MEDICINE.

PROFESSOR LAW.

1. What are the pathological conditions of intra-thoracic organs which produce permanent alteration in the form of the chest?
2. What is the rationale of such alteration of form?
3. In cases of ascites what circumstances will determine you to resort, without delay, to the operation of paracentesis abdominis?
4. How many kinds of cerebral softening are there?
5. What is the pathological nature of each?
6. What appearances does each present under the microscope?
7. What pathological conditions of the heart often induce cerebral disease?

8. To what do the lungs owe their not suffering from the excited action of the heart, and they being so near the heart, while the more distant brain is often injured by this organ ?

9. How does an adherent pericardium affect the nutrition of the heart ?

10. Describe the process of death by asphyxia ?

11. What portion of the brain is least tolerant of injury, or whose injury produces the largest amount of general mischief ?

12. What is Bizot's law relative to the pathology of arteries ?

MIDWIFERY.

DR. CHURCHILL.

1. What treatment would you advise in prolapse of the funis ?

2. Describe the symptoms of rupture of the uterus.

3. How would you treat secondary hemorrhage ?

4. In a case of accidental hemorrhage, would it be wise to rupture the membranes before regular pains set in ?

5. What remedy against the hemorrhage in placenta prævia would you adopt at the commencement of labour ?

MEDICAL JURISPRUDENCE.

DR. BRADY.

1. Indicate the means, medicinal and mechanical, usually employed for the purpose of procuring criminal abortion.

2. Contrast the characters of the putrefactive changes that occur in a child, *dead in utero*, and retained for eight or ten days, with those of a still-born child confined and buried for the same period.

3. Certain changes occurring in dead bodies during the progress of decomposition may be mistaken for pathological phenomena; refer to some of those, and state the mode of determining their real character.

4. What method would you adopt for the detection of *bichloride* of mercury in matters vomited, or the contents of the stomach ?

5. Describe a process for the detection of oxalic acid in the stomach, in a case where antidotes had been freely exhibited.

6. Give a good differential test of arsenic and antimony deposited in a tube of Marsh's apparatus.

7. There are poisons whose operation may be satisfactorily established from the symptoms and autopsic appearances, in the absence of all chemical proof. Give examples of this class.

CHEMISTRY.

DR. APJOHN.

1. Mention and explain any process with which you are acquainted for determining the amount of moisture in a given bulk of air.

2. Give a description of Daniell's sustaining battery ; and mention the manner of using a galvanic machine, so that the current produced shall be independent of the number of couples.

3. If the same current be made to pass successively through acidulated water, a solution of sulphate of copper, and melted chloride of silver, each undergoes electrolysis. What are the relative weights of the hydrogen, the copper, and the silver obtained in the experiment ?

4. In what condition does the iron exist in most chalybeate waters ?—what test would you apply to detect it ?—and why upon keeping do such waters deposit the iron ?

5. How would you make the analysis of a mixture of aqueous vapour, carbonic acid, oxygen, and nitrogen ?

6. Describe the mode of preparing the sulphide of hydrogen ; and state the nature of the precipitates which are obtained on passing the gas into solutions of arsenious acid, sulphate of copper, and persulphate of iron.

7. What is the formula of crystallized hyposulphite of soda ?—how is it made ?—and what is its application in volumetric analysis ?

8. Chlorine, iodine, and bromine exert each a similar action on solution of potash ; what is it ?

9. Write the formula of amylic alcohol, and of valerianic acid ; and describe how the former may be converted into the latter.

10. How would you examine the urine for bile, for albumen, and for sugar ?

BOTANY.

DR. HARVEY.

1. Give the characters by which modifications of the root may be known from underground, rootlike stems.

2. What difference of arrangement is observable between the cells in the upper and the under surfaces of leaves, and what purpose is thereby served ?

3. Explain the terms *didynamous*, *tetradynamous*, *monadelphous*, *syngenesious*, *gynandrous*, *monœcious*, *diœcious* ; giving examples of each.

4. Describe the usual structure and the functions of a stomaie ; and give an instance in which stomates are found on the *upper* surface of leaves, while absent from their *under* surface.

5. What is the usual structure of pollen ? In what plants do the pollen-grains cohere in clusters or masses ?

6. By what floral character are *Ranunculaceæ* known from *Rosaceæ* ?

7. What is the structure of the ovary and seed in *Caryophyllææ* ?

8. Describe the flower and fruit of the genus *Linum*.

9. In what monopetalous Orders do you find didynamous stamens ?

10. By what circumstance should you infer that an unknown Umbelliferous plant was probably wholesome or the reverse ?

11. In what parts of plants should you expect to find *fixed* oils, and in what parts *volatile* oils ?

12. Refer the plants before you to their natural Orders, and write a description of any one of them according to the following formula:—

- (a) *Stem*, General character.
- (b) *Leaves*, Arrangement.
- (c) ——— Stipulation.
- (d) ——— Composition.
- (e) ——— Form.
- (f) ——— Margin and incision.
- (g) Venation.
- (h) *Inflorescence*, General character.
- (i) ——— Bracteal appendages.
- (j) *Flower*, Peculiarities of calyx.
- (k) ——— corolla.
- (l) ——— stamens, noticing insertion.
- (m) ——— Disk.
- (n) ——— Pistil, as to ovary, style, stigma, and placentation.
- (o) *Fruit*, General character, dehiscence, placentation.
- (p) ——— Arrangement of embryo in seed.
- (q) Reasons for referring a specimen to a particular Order; general characteristics of the Order, and its geographical distribution.

EXAMINATION FOR DEGREE OF MASTER IN SURGERY.

DR. ADAMS.

1. Suppose the globe of the eye enlarged, and the seat of melanotic disease, what would be your prognosis, and surgical treatment?
2. In a case of external melanotic disease which had been excised, recurred, and after three or four years proved ultimately fatal—in what organs or tissues would you seek for melanotic growths on making the *post-mortem* examination?
3. In cases of obstinate strictures of the urethra, in which the treatment by simple dilatation has failed, what operations are proposed by surgery?
4. Describe Professor Symes' mode of performing the operation called by him the perineal section, and by others, "external urethrotomy."
5. Describe Mons. Civrale's mode, called "internal urethrotomy."
6. Describe Mr. Holt's plan.
7. The advantages of these operations, respectively, as well as the dangers encountered?

SURGERY.

DR. SMITH.

1. Contrast the symptoms and post-mortem appearances of acute and chronic necrosis.
2. What are the characters of the injury described by Mr. Hey under the name of "internal derangement of the knee-joint"?

3. Distinguish between prolapsus of the rectum and prolapsus of a portion of intestine through the rectum. What danger attends an error in diagnosis between these two different forms of disease?
4. Mention the circumstances which, in a case of calculus in the bladder, would prevent your performing the operation of lithotomy. There are cases of vesical calculus in which constitutional treatment may be necessary previous to the performance of the operation. Mention them, and the treatment you would adopt in each.
5. In what cases would you prefer the operation of lithotritry to that of lithotomy? What preparatory treatment is necessary in such cases?
6. Describe the operation of puncturing the bladder above the pubis; in what cases would you have recourse to it?
7. Mention the danger attending anthrax in the following situations :—on the back of the head; in the abdominal parietes; under the rectum. Write a prescription for a fermenting poultice.
8. Mention the characters of separation of the upper epiphysis of the humerus, and the mode of treating the injury.
9. Describe the characters of the vertical displacement of the patella, and of the complete luxation of that bone outwards.
10. Contrast benign and malignant nasal polypi; describe Levret's canula.
11. In what cases of hydrocele of the tunica vaginalis would you select the treatment by incision? Describe Kinder Wood's operation.
12. Mention the characters and treatment of venereal disease of the testicle.

SURGICAL PATHOLOGY.

DR. SMITH.

1. What are the pathological characters of osteo-aneurism? Give a short abstract of the observations of Breschet and Handyside upon this disease.
2. Contrast the pathological characters of ganglions and synovial cysts.
3. Describe the skeleton of a foot that has been for many years affected with varus.
4. What are the anatomical characters of congenital luxation of the hip-joint?
5. Describe the condition of the arteries and veins of the fore-arm in cases of varicose aneurism situated at the bend of the elbow.

ANATOMY AND PHYSIOLOGY.

PROFESSOR M'DOWEL.

1. Enumerate the bony connexions which must be severed in the removal of the superior maxillary bone.

2. Enumerate in order the parts that must necessarily be removed in order to expose the hyoglossus muscle.
3. State the anatomical differences which exist between congenital and infantile hernia.
4. What structures are divided in Amussat's operation for artificial anus?
5. Mention the principal channels by which carbon is eliminated from the system, and give an approximation as to the quantity discharged through each.
6. Describe the thorax in birds, and mention the peculiarities of their mode of respiration.
7. Enumerate the muscles which elevate and those which depress the acromion process.
8. Give the distribution of the glosso-pharyngeal nerve, and assign its functions.

DR. STOKES.

1. Describe otorrhœa and its consequences; mention the conditions under which it becomes a fatal disease; describe the cases in which surgical interference becomes necessary.
2. How would you treat peritonitis following on the operation of paracentesis of the abdomen?
3. What are the circumstances in which you would decline to operate in fistula in ano?
4. Describe two pulsating tumours of the thorax which are not examples of aneurisms of the aorta.
5. What cases of external cancer are most likely to be followed by malignant disease of viscera?
6. In hot climates, what disease commonly precedes abscess of the liver?

CHEMISTRY.

DR. APJOHN.

1. Write the formulæ of calomel and corrosive sublimate, and explain how you would detect the latter if present in the former.
2. How would you examine a powder consisting of morphia and strychnia so as to determine the amount of each?
3. How would you distinguish a solution of tannic from one of gallic acid, a solution of citric from one of tartaric acid, and a solution of potash from one of soda?
4. How would you ascertain whether sulphate of quina included cinchona?
5. Write the formula of the bleaching salt of lime, and explain the action of muriatic acid upon it.

6. What is the readiest mode of ascertaining whether oil of vitriol has been purified by distillation, and whether it is arsenical or not?
7. Red oxide of mercury is sometimes adulterated with the red oxides of iron and of lead; how are such adulterations discovered?
8. Mention the method of the London Pharmacopœia for determining the strength of hydrocyanic acid.
9. How, by the soap-test, would you determine the degree of hardness of a water?
10. Enumerate the acids used in medicine, write their formulæ, and give the action exerted by each on metallic zinc.

EXAMINATION FOR PREMIUMS IN CIVIL LAW.

PROFESSOR ANSTER.

1. Give Justinian's definition of liberty.
2. Do you regard this as adequate; if not, how is it inadequate?
3. Sir Edward Creasy quotes a passage from Guizot, who, speaking of the Restoration in England (1660), says that the Revolution through which England had passed terminated in three great results; what were they?
4. State the date of the Petition of Right.
5. When were military tenures abolished in England?
6. When was the Habeas Corpus Act passed?
7. When was the Bill of Rights passed?
8. In the law of adoption, as modified by Justinian, was the relation of the adopted person, with respect to his original family, varied by the fact of his being given by his father in adoption to a stranger to the family?
9. Did such adopted son lose his rights of inheritance from his father? Did he gain any rights with respect to the property of the stranger to whom he was so given in adoption?
10. In the previous state of the law what serious disadvantage, with respect to property, existed, to such adopted person?
11. Where the relation of brother and sister existed as the consequence of adoption, did it interfere with intermarriage between persons so connected?
12. Where the relation of father and daughter existed by adoption, did it interfere with the intermarriage of such persons?
13. State any distinction that existed between the cases adverted to in the two last questions.
14. Give the definition of *capitis minutio*, or *deminutio*, which you find in Gaius and Justinian.

15. There are three kinds of *capitis deminutio* mentioned; state the effect of each.

16. A *filius familias* might exercise the office of "tutor" or guardian; what principle is referred to, to account for this?

17. A class of rights are known in the Roman law as *Servitutes prædiorum*; state the nature of the rights so designated, and state why called *Servitutes*, and why *Servitutes prædiorum*?

18. Explain the maxim *Servitus non potest esse servitutis*.

19. Define *Usufructus*.

20. Explain what is meant by *pupillary substitution*.

21. What class of heirs were called *necessarii*?

22. What class were called *sui et necessarii*?

23. Give Justinian's definition of a legacy (*legatum*).

24. Justinian states that in the earlier Roman law there were four different kinds of legacy; state the four.

25. State the precise effect of each of the four.

26. State the general object of the *Lex Falcidia*.

27. Define or describe *fidei-commissaria hæreditas*.

28. State the words ordinarily used in creating *fidei-commissa*.

29. Give Justinian's definition of "liberty."

30. Give Justinian's definition of *ingenuus*.

31. Was the adopting father, under Justinian's modification of the law of adoption, compelled to leave by his will, or otherwise, any portion of his property to the person adopted?

32. State the modes by which the *patria potestas* was terminated.

33. Might a person appoint more than one heir?

34. Assume a Roman testator leaving part of his property undisposed of by his will; what became of such undisposed residue?

35. In Mr. Heron's "History of Jurisprudence," a passage is quoted from Strabo with reference to the legislation of Minos, in which liberty is stated to be the greatest advantage citizens can have; state the reason assigned for this, and the general purport of the passage.

36. State, from Mr. Heron's book, an early definition of virtue, "the oldest, Dugald Stewart says, we have, and the most unexceptionable."

37. Give, from the same work, Socrates' definition of "justice."

38. Define a law (*lex*) as understood in Roman jurisprudence.

39. Define a *plebiscitum*.

40. In the reign of Louis XIV. many attempts were made to reform the laws of France. The plan adopted was to systematize, and unite into one ordinance, all the laws on each particular subject; state the ordinances and the subjects to which they related, framed with this object in the 17th century; giving, from Mr. Heron's work, the names of the compilers, and the date of each ordinance.

41. Mr. Merivale states one important present advantage resulting from

an examination of the steps by which the first Roman emperors changed the republic into a monarchy.

42. In the change from the early monarchy to a republic the prerogatives of the king were not essentially altered; what were the means then taken for "securing popular independence"?

43. At what period does Mr. Merivale describe the military oath of obedience "to the emperor and the state" as first taken by the soldiery?

44. One of the titles which aided Augustus most in converting the republic into a monarchy was that of *princeps senatus*; what privileges did the position of *princeps senatus* give?

45. From the titles of the imperial constitutions Mr. Merivale infers the importance of the style of *princeps*; state how this was.

46. The signification of the title had become varied in the times of Tiberius; state how Mr. Merivale proves this.

47. Augustus, in the year of the city 731, refused to allow himself to be elected Consul—he, however, managed to secure to himself more than the advantages of the consulate—state how this was.

48. He was given, without the tribuneship, the *tribunitia potestas*; what were the great advantages this gave him?

49. Dean Milman says, that when Christianity had become the religion of the Empire, new corporate bodies had been formed, holding property of every kind by a new tenure; what were those corporate bodies?

50. A new offence was introduced into the criminal jurisprudence not only of the Church but of the Empire; what was it?

51. The barbaric codes, though for the most part embodying principles which had been those of the Teutonic peoples anterior to their conversion to Christianity, were deeply imbued with Christian feeling; how was this?

52. The peculiar and special jurisprudence of Christianity had gradually become vested in the clergy, and the Church enacted canons in local or national synods; of these canons what were the sanctions?

53. The bounds of ecclesiastical and temporal jurisdiction became confused? State the cause which Dean Milman assigns for this on the part of the State.

54. State the cause he assigns on the part of the Church.

55. In the sixth century there were three systems of jurisprudence; what were they?

56. Justinian affirmed the right of the emperor of legislating for the Church. How is this proved?

57. A new order of magistracy acknowledged "at the inspiration of Christianity." State how this was?

58. State how the law of persons, as it had previously existed in the Roman Empire, was affected by Christianity. State this as fully as you can with reference to the different relations of life and society.

59. A law of Leo and Anthemius, limited to Constantinople, which was confirmed among other laws for the security of Church property by

Justinian, and by him extended to the whole empire, is described by Dean Milman as "the palladium of Church property." State this law.

60. Dean Milman eulogizes the person "who seems to have been the first who enfranchised slaves on the pure and noble principle of the common equality of mankind." Whom does he name?

61. In the changes which the system of trial by jury has undergone, one principle has remained unchanged; what is that principle?

62. Jurors were, at one period, fined when the court regarded them as bringing in verdicts contrary to evidence; state at what time this practise ceased, and the particular case in which it was determined to be illegal.

63. Mr. Story commences his work on "The Conflict of Laws," or private international law, by stating three maxims or axioms upon which all reasoning on the subject must rest; what are they?

64. He quotes from Boullenois five general principles on the subject; state them.

65. In every discussion on this subject three axioms laid down by Huberus are cited, which he deems sufficient to solve all the intricacies of the subject; state them.

66. Give Cicero's definition of war (*Bellum*).

67. State Grotius's objection to this definition.

68. Give Grotius's definition of war.

69. Is what Grotius calls "*jus naturale*" immutable, or can any circumstances be imagined in which the principles to which he gives that name may be supposed changed.

70. How does he define *jus voluntarium humanum*?

71. What is his definition of *civile jus*?

72. Grotius distinguishes the *jus gentium* from the *jus naturale*, and says, "*sæpe in unâ parte orbis terrarum est jus gentium quod alibi non est*;" and he illustrates the statement by examples; what are the illustrations he gives?

EXAMINATION FOR PRIZES IN POLITICAL ECONOMY.

PROFESSOR HOUSTON.

Morning.

1. The conduct of a miser, according to Archbishop Whately, produces different effects in different states of society?

2. Describe the aim and general scope of Mandeville's "Fable of the Bees."

3. Define the following terms according to Mr. Senior:—"Capital," "Labour," "Abstinence," "Rent," "Cost of Production."
4. Compare the views of Mr. Senior and Mr. Mill on the circumstances which regulate the rate of wages.
5. The "value of money" is an ambiguous expression. Explain what regulates the value of money in its several significations.
6. How does Dr. Longfield account for the decline of profits in the progress of society? How was the same phenomenon accounted for by Adam Smith?
7. Explain the influence of changes in the price of food on the rate of wages.
8. What are the views taken by Smith, Senior, and Mill, respectively, on the subject of Productive and Unproductive Labour?
9. By what circumstances is the natural amount of currency in a country determined, according to Dr. Walsh?
10. What is the nature of an Economic Law, and of the truth which it represents?
11. Rent, according to Professor Cairnes, arises from two distinct sources. Point out what these sources are, and what differences exist between the two species of rent resulting from them, respectively.
12. Has the present distribution of landed property in these countries any, and if so what, effect on the price of agricultural produce?

Evening.

1. Trace the effects of a Commercial Crisis on the Production and Distribution of Wealth.
2. Commercial Crises are attributable to a variety of causes?
3. The periodical recurrence of Commercial Crises, so far as it is a fact, can be accounted for on economic principles?
4. *a.* Detail the provisions of the Bank Charter Act of 1844.
b. State the principle on which that measure is founded, and how far you consider it to be sound.
c. Within what limits may an extension of credit safely take place during the descending phase of a Commercial Crisis?
5. Explain the meaning of the phrase, "freely-produced commodities." What is the law by which the value of such things is governed, and how does it operate?
6. Some important distinctions exist between the laws which govern the value of agricultural and those which govern that of mineral produce? The rent yielded by the latter does not admit of so simple a measure as that yielded by the former?

ENGINEERING EXAMINATION.

MIDDLE CLASS.

THEORY OF THE STEAM-ENGINE.

PROFESSOR GALBRAITH.

1. The boilers of a pair of marine engines evaporate 400 cubic feet of water per hour, the diameter of the piston is 82 inches, and length of stroke 6 feet 9 inches; find the horse-power when the steam is cut off at half stroke, the number of revolutions per minute being 12.

2. Find the pressure in the cylinders before the steam is cut off.

3. From the same data find the number of revolutions in order to obtain the maximum useful effect, if the boiler be loaded to 10 lbs.

4. Express the velocity of the piston of a locomotive, and also the pressure in the cylinder due to the weight of the train, in terms of the speed in miles per hour on a level road.

5. How is the expression for the pressure modified if the train ascends or descends a gradient.

6. Prove the following equation for the motion of a locomotive on a level rail

$$y^3 + 5y^2 + 16 \left(10 + \frac{4}{\lambda d^2} T \right) = \left(\frac{kS}{d^2} \right) \times 391000,$$

in which

$$y = \lambda M \text{ and } \lambda = \frac{l}{D}.$$

7. If the diameter of driving wheel be 5 ft., length of cylinder 16 in., diameter of piston 12 in., and weight of train 100 tons; calculate the number of gallons of water required for an hour's drive along a level road.

8. Calculate the quantity required to ascend a gradient of 1 in 250 during the same time.

9. If the weight of the train be 48 tons, and, $S = 0.7$; find the speed of train in miles per hour on a level rail.

10. If the diameter of driving wheel be 8 ft., length of cylinder 2 ft., diameter of piston 20 in., weight of train 100 tons, and $S = 2.4$; calculate the speed in miles per hour on a level rail.

PRACTICAL MECHANICS.

MR. TOWNSEND.

1. A weight of 112 lbs. rests on a rough inclined plane whose length and height are 76 and 43 feet, respectively; if the coefficient of friction be $\frac{1}{4}$, required the least horizontal force that will suffice to sustain it.

2. A ladder, 120 lbs. weight and 20 feet long, rests against the face of a vertical wall at a point 17 feet from the ground; if its centre of gravity be 8 feet from its base, required its pressure against the wall.

3. A wall of brickwork, 20 feet high and $1\frac{1}{2}$ feet thick, is acted on at every foot of its upper internal edge by a force P inclined at an angle of 30° to the ground; assuming the weight of a cubic foot of brickwork to be 112 lbs., required the greatest value of P that will just not overturn the wall.

4. In the same case, if the wall be supported at every 20 feet of its length by a triangular buttress of its own height, $1\frac{1}{2}$ feet in breadth, 3 feet in thickness at the ground, and tapering to nothing at the top; required the greatest value of P that will just not overturn the entire structure.

5. In a rectangular reservoir of water, 20 feet deep, 50 and 36 feet broad at the surface and base, respectively, and 100 feet long throughout; assuming the weight of a cubic fathom of water to be 6 tons, calculate the entire pressures on its sloping and vertical faces.

6. In the same case, calculate the moments of both pressures to overturn the retaining walls, supposed both vertical outside, and 3 feet thick at the top.

7. In the equilibrium of a suspension bridge under the action of gravity, if the roadway be perfectly flexible, uniform, and of considerable weight compared with that of the supporting rods and chains, show that approximately the forms of the latter are parabolas.

8. Given, in the same case, the span and central deflection of the supporting chains, required the variation of the latter consequent on a small variation in the length of the chains, arising from change of temperature or any other cause.

9. Investigate the formula for the central deflection of a uniform rectangular beam of given dimensions, weight, and elasticity, supported, but not fixed, in a horizontal position, by two props placed under its extremities, and bent by its own weight.

10. For a girder of uniform thickness, and uniformly loaded, required the best form of vertical section to resist fracture by bending.

DR. DOWNING.

1. Calculate the radius of a segmental arc 28 ft. span, 6 ft. rise.

2. Calculate the radius of a cast iron segmental arch 179 ft. span, and 17.9 ft. rise, and give the rule for readily determining the radius with that proportion of rise to span.

3. Compute the vertical ordinate in No. 1 at a point 5 ft. from the springing; and if the arch had been a semiellipse with same span and rise as in No. 1, calculate the vertical ordinate at that point.

4. Calculate the number of cube yards in the cutting of the section below:—Base 30 ft., and side slopes $1\frac{1}{4}$ to 1—

$$\begin{array}{ccccccc} & & 35 \text{ ft.} & & 18 \text{ ft.} & & \\ & & \uparrow & & \uparrow & & \\ < \dots 212 \text{ ft.} \dots & \times & \dots 95 \text{ ft.} \dots & \times & \dots 77 \text{ ft.} > \end{array}$$

5. If a portion of an excavation have the two end heights equal, each being 30 ft., the base being 20 ft., and slopes 2 to 1; the ground on the surface having a transverse slope of 12 to 1; calculate the increase of excavation in cubic yards caused by this slope above that of level ground, the length being 297 ft.

6. In a portion of a cutting, 200 feet in length, base 30 feet, slopes $1\frac{1}{2}$ to 1, the heights at each end being 40 feet and 10 feet, respectively; calculate the distance from either end at which a vertical plane being drawn, it will divide the block into equal portions.

7. In the annexed sketch map of contoured ground, show how you would obtain the height of any point as *A* situated between two figured contour lines.

8. Draw a line across the contours drawn on the annexed plan which shall have an inclination of 1 in 12.

9. State the number of feet per mile ascent in the following gradients: 1 in 270, $\frac{1}{8}$ th inch in a yard, 7 inches per statue perch.

10. On a map whose scale is $\frac{1}{5000}$, a square is drawn $3\frac{1}{2}$ inches in the side, calculate the number of acres it encloses.

11. A railway has to be carried over a road 25 feet square width, the axis of the road and railway intersect at 38° ; calculate the length of the girders required, the bearing upon the abutment being 2 feet on each end.

12. In an oblique arch, being a semicircle 30 feet on the square span; calculate the angles β and ϕ , the angle of intersection of the axes of road and railway being 40° , using the letters in the same signification as in the Text-book.

JUNIOR CLASS.

THEORETICAL MECHANICS.

MR. TOWNSEND.

1. When three forces equilibrate at any point in a plane, show that their moments equilibrate round every point in the plane.

2. For any system of parallel forces, show that the sum of their moments round any line perpendicular to their common direction is equal to the moment of their resultant round the same line.

3. Given the masses of any number of material particles, and their distances from any plane, required the distance of their centre of gravity from the same plane.

4. A uniform beam of given length and weight is supported from a fixed point by cords of given lengths attached to its extremities; required the tensions on the cords.

5. A ladder supported on a rough floor rests against a smooth wall, vertical or inclined; given its weight, dimensions, and position, required its pressure against the wall.

6. In a rectangular reservoir of given dimensions, filled with water, required the entire pressures on the vertical faces and their moments to overturn the retaining walls.

7. If two opposite sides of the reservoir slope, the remaining two continuing vertical; required, as before, the entire pressures and moments for the vertical faces.

8. Explain the most accurate method with which you are acquainted of determining the specific gravity of a solid lighter than water.

9. Required what statical force, acting freely for one second on the mass of a ton weight, will get up in it a velocity of 100 feet per second.

10. Required the centrifugal force of a mass a ton weight performing one revolution per second in a circle of 6 feet radius.

11. If a body be projected vertically upwards with a velocity of 1000 feet per second, required the extreme height to which it will ascend, and the time it will take to reach it.

12. If a body be projected obliquely with the same velocity at an elevation of 45° , required its range on a horizontal plane passing through the point of projection, and the time it will take to reach it.

EXAMINATION FOR PREMIUMS IN IRISH.

PROFESSOR O'MAHONY.

Translate any two of the following passages from English into Irish :—

1 Cor. iii. 9-15.

Heb. ix. 13-15.

1 Tim. vi. 1-4.

Translate the following passages from Irish into English :—

1 Cor. ix. 24-27.

2 Tim. iii. 1-5.

1. Discuss briefly the question of the antiquity of letters in Ireland.
2. Mention some of the principal features which distinguish the Irish from the other living Celtic dialects.
3. Give the modern and ancient Irish for the following words: Servant, ministry, faith, contrary, image, comparison, conscience, persecution, circumcision.
4. In what respects chiefly does the modern Irish differ from the more ancient language?

5. It is often said that the Irish wants words for *gratitude* and *profess*; show that such is not the case.

6. Derive the words, *poḡnaḡn*, *cunḡnaḡn*, *impeaḡ*, *poḡcaḡc*.

7. The derivation and composition of Irish words is frequently obscured by the use of a comparatively modern rule in orthography?

8. To which of the classical languages has the Irish, as it now exists, the greatest resemblance? Give instances, and account for the fact.

9. Give a general account of the verb system of the Irish; and conjugate at length the verb *ḡm*.

10. In what circumstances does the substantive not modify the form of the adjective?

11. Mention some of the idiomatic meanings of the prepositions *ar* and *ar*.

12. Give some instances of the use of the impersonal passive in Irish.

GENERAL DIVINITY EXAMINATION*.

SENIOR CLASS.

PROFESSOR OF DIVINITY'S LECTURES.

ROMISH CONTROVERSY.

1. The divergence of the Romish and Reformed dogmatic systems begins with the state of man before the fall?

2. What is the fundamental distinction between the Romish and Reformed doctrines respecting *Justification*?

3. Explain exactly what the Schoolmen meant by *meritum de congruo* and *meritum de condigno*.

4. "Faith" has very different significations in the Romish and Reformed systems, respectively?

5. What is meant by "*fides formata*"? Refute the argument in support of it adduced by Romanists from the Epistle to the Galatians.

6. The dogma of Papal Supremacy *de jure divino* is intimately connected with another fundamental article of the Romish Creed?

7. The argument by which the former is sought to be established consists of three propositions, not one of which can be proved?

8. The Papal Bulls down to the eleventh century exhibit decisive evidence against the dogma of the Supremacy of the Pope?

* The greater part of these Examinations is conducted *visâ vocis*.

9. The history of Heresy and Schism also furnishes an unanswerable argument against it?

10. The foundation of the Papal power is mainly due to three of the early Popes?

11. Even as a theory, Infallibility is defective in two essential points?

12. What is the Archbishop of Dublin's argument against Infallibility, founded on a well-known passage in the Acts?

13. Enumerate the Seven Romish Sacraments in their proper order, and point out their mutual relations.

14. Who first introduced the word "*Sacramentum*" into Ecclesiastical language? Corresponding Greek word?

15. Which of the five so-called Sacraments was first promoted to the rank of a Sacrament; and what was the cause of its being so exalted?

16. The scholastic terms, *materia* and *forma*, applied to the Sacraments, are derived from a well-known definition of Augustine?

17. The doctrine of *Intention* is based on a principle of the Aristotelian philosophy adopted by the Schoolmen?

18. According to the Romish theory, the Eucharist differs essentially, in one respect, from all the other Sacraments?

19. As regards the *mode of the presence* of Christ in the Eucharist, the Roman Catechism is at direct variance with the Council of Trent?

20. What is the difference between *impanatio* and *consubstantiatio*? and in what sense do the Lutherans *not* hold the latter?

21. What is meant by *communicatio idiomatum*, and for what purpose was it invented?

22. The Lutheran *Formula Concordiæ* says: "*Rejicimus . . . externa visibilia elementa panis et vini in sacramento adoranda esse.*" Why so?

23. The Romish doctrine respecting the Rule of Faith necessarily involves that of the Infallibility of the Church?

24. What is the distinction between *inhesive* and *declarative* Tradition? Show that the Tradition sanctioned in the fourth Session of the Council of Trent is different from both.

BIBLICAL CRITICISM.

1. What is meant by the *Masoretic Recension*? Give a brief account of its origin.

2. What is meant by "the Hebrew tongue" spoken of in Acts, xxi. 40, and elsewhere in the New Testament? Give a sketch of its history.

3. What are the characteristic constituent elements of the New Testament Greek, as compared with Classical Greek?

4. Whether are the most ancient known MSS. of the Greek or Hebrew Scriptures the older? What is the difference in age between them?

5. Give a sketch of the history of the LXX. Version.

6. What is the relation of the Vulgate to the Ante-Hieronymian Version?
7. State the Recension theory of Griesbach.
8. What did Hug mean by the *κοινή έκδοσις*?
9. Mr. Scrivener lays down three fundamental rules for the employment of ancient authorities in the textual criticism of the New Testament?
10. What is the "*Textus receptus*"? Give a sketch of the history of its formation.
11. Earliest printed, and earliest published, Greek Testament?
12. Give a brief account of Cod. $\aleph$, and of the controversy which has arisen respecting it.
13. Mention some of the most important of the other Uncial MSS.
14. One of the Cursive MSS. has occupied the foremost place in a famous doctrinal controversy? Give a sketch of this controversy.
15. When, where, and why, was the Douay Version made?
16. How long has our present Authorized Version been in use? and on what previous English Versions is it mainly based?
17. The obsolete words in our Authorized Version fall into two distinct classes? Give examples of each.
18. The Latin title of the sixth Article furnishes an important indication of the views of our Reformers respecting the *inspiration* of the Scriptures?

JUNIOR CLASS.

DR. LEE.

Write a brief Essay on *each* of the following subjects:—

1. A popular reply to the modern aspect of Pantheism.
2. Miracles are not inconsistent with the fact that the government of the universe is carried on by general laws.
3. What place does Christ's "satisfaction" for sin hold in the doctrine of the Atonement?

SIZARSHIP EXAMINATION.

Science Sizarship.

TRIGONOMETRY.

MR. WILLIAMSON.

1. Find the values of θ between 0 and $\frac{\pi}{2}$ which satisfy the relation

$$\sin \theta + \cos 4\theta = 0.$$

2. Prove that

$$\tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{5} + \tan^{-1} \frac{1}{7} + \tan^{-1} \frac{1}{8} = \frac{\pi}{4}.$$

3. In a plane triangle prove that

$$2(ab + bc + ac) > a^2 + b^2 + c^2,$$

and

$$\cos A + \cos B + \cos C = 1 + 4 \sin \frac{A}{2} \sin \frac{B}{2} \sin \frac{C}{2}.$$

4. Find the sum of n terms of the series

$$\sin^2 \alpha + \sin^2(\alpha + \beta) + \sin^2(\alpha + 2\beta) + \&c.$$

5. If the alternate angles of a regular polygon of n sides be joined so as to form another regular polygon of n sides; express the ratio of their areas, and apply to the cases where $n=4$ and $n=6$.

6. If D be the middle point of the base AB of a spherical triangle (ABC) , prove that

$$\cot A - \cot B = 2 \cos \frac{C}{2} \cot BDC.$$

7. If O be the point of intersection of the bisectors of the sides of a spherical triangle, prove for the bisector CD , that

$$\sin CO = 2 \sin OD \cos \frac{C}{2}.$$

8. In a spherical triangle, prove that

$$\tan \frac{a}{2} \tan \frac{b}{2} = - \frac{\cos S}{\cos(S-C)},$$

and hence deduce the formula

$$\cot \frac{\Sigma}{2} = \frac{\cot \frac{a}{2} \cot \frac{b}{2} + \cos C}{\sin C}$$

9. Being given

$$\cos \theta = \frac{\sin \beta}{\sin \alpha}, \quad \cos \phi = \frac{\sin \gamma}{\sin \alpha},$$

q 2

and

$$\cos(\theta + \phi) = \sin \beta \sin \gamma,$$

prove that

$$\tan^2 \alpha = \tan^2 \beta + \tan^2 \gamma.$$

10. If α , β , γ denote the distances of a point from the angles of a spherical triangle, find its locus when

$$\cos \alpha + \cos \beta + \cos \gamma = 0.$$

1. Find expressions for the secant and cosecant of 18° , and calculate their values to four decimal places without the aid of logarithms.

2. Prove that the modulus of the common system of logarithms is equal to $\frac{1}{\log_e 10}$; and calculate the value of $\log_e 10$ to five places of decimals.

3. The sides of a spherical triangle are $36^\circ.27'$, $41^\circ.39'$, $45^\circ.44'$; calculate its spherical excess.

4. The mast-head of a ship is 210 feet above the water; calculate its distance from the visible horizon.

5. In a spherical right-angled triangle one side is $169^\circ.20'$, and the adjacent angle $23^\circ.27'$; calculate the remaining sides.

6. Assuming the ordinary expansions for $\sin x$ and $\cos x$, calculate to five decimal places the value of either $\sin 3^\circ$ or $\cos 3^\circ$.

7. Two sides of a plane triangle are 645.4 and 372.3, and the included angle $73^\circ.25'$; calculate the third side.

8. Given $\log 15 = 1.17609$, and $\log 108 = 2.03342$; find the logarithms of 3, 3 and $0.23'148''$.

ALGEBRA AND ARITHMETIC.

MR. STURTS.

1. Apply Sturta's theorem to the equation

$$x^3 + 6x^2 + 4 = 0.$$

2. Approximate, by Horner's method, to the real roots of

$$3x^3 + 5x - 40 = 0.$$

3. Find the reducing cubic in Euler's solution of the biquadratic

$$x^4 - 25x^2 + 60x - 36 = 0;$$

and apply Des Cartes' method to the solution of the same equation.

4. Solve the simultaneous equations,

$$x - y + z - 3 = 0,$$

$$xy - z^2 + 10 = 0,$$

$$x^2 + y^2 + z^2 - 29 = 0.$$

5. Resolve into its partial fractions,

$$\frac{x^3 + 2x}{(x-2)^2(x+3)}.$$

6. If a, b, c be the roots of $x^3 - px^2 + qx - r = 0$, then will

$$(b-c)^2(c-a)^2(a-b)^2 = \frac{4}{27}(3q-p^2)(3pr-q^2) - \frac{1}{27}(pq-gr)^2.$$

7. The reciprocal of the root of the equation

$$x^n + px^{n-1} + qx^{n-2} + \&c. = 0$$

may be expanded in a series

$$-\frac{1}{p} - \frac{q}{p^2} - (2q^2 - pr) \frac{1}{p^3} - \&c.$$

8. Find the coefficient of x^n in the expansion of

$$\frac{a + bx}{b + mx}$$

in a series of ascending powers of x , and show that if this be A_n and B_n the coefficient of the expansion of the same fraction in a series according to descending integer powers of x ; then

$$A_n \times B_n = -\frac{(ma-b)^2}{m^2 b^2}.$$

9. If $1, \frac{p_1}{q_1},$ and $\frac{p_2}{q_2}$ &c., be successive convergents to $\sqrt{2}$, then will

$$2 \tan^{-1} \frac{q_{n-1}}{q_n} + (-1)^n \tan^{-1} \frac{1}{p_{2n}} = \frac{\pi}{4}.$$

10. If $2s = a + b + c$, then will $3abc = s^3 - (s-a)^3 - (s-b)^3 - (s-c)^3$.

11. If a be an approximate value of x in any equation, and b, c be the results when a is substituted for x in the original and limiting equations, then $x = a - \frac{b}{c}$ nearly.

12. If $\delta, \alpha \pm \beta \sqrt{-1}$ be the roots of the cubic $x^3 + ax^2 + bx + c = 0$, of which δ is real, and if $x^3 + Ax^2 + Bx = 0$ be the equation which results from the diminution of the roots of the above by δ , then

$$\alpha = -\frac{A}{2} + \delta; \quad \beta = -\frac{1}{2}(B + 3b - a^2).$$

13. A person engaged in business employs a capital of £1500 with a view to retire in 25 years; the business makes a return of 10 per cent. four times a year; half the profits are regularly invested in extending the business. What sum will he have to retire upon? and what will be his income if he invests his capital on retiring in the 3 per cent. Consols at 94 $\frac{1}{2}$?

14. Find an equation whose roots are the squares of the differences between the roots of $x^4 - 15x^3 + 63x^2 - 41x - 120 = 0$.

15. Find to three places of decimals the roots of $x^3 - 11x + 12 = 0$.

GEOMETRY.

MR. TOWNSEND.

1. Given of a quadrilateral the sides and the area, construct it; and determine, from your construction, the limits of possibility as to the magnitude of the latter when the former only are given.

2. Given of a quadrilateral the diagonals and the angles, construct it; and determine, from your construction, the limits of possibility as to the ratio of the former when the latter only are given.

3. Given the species of a quadrilateral, construct it—(a) so that its vertices shall lie on given lines; (b) so that its sides shall pass through given points.

4. Given the species of a triangle, construct it—(a) so that its vertices shall lie on given circles, and its area be a minimum; (b) so that its sides shall touch given circles, and its area be a maximum.

5. For two triangles in perspective prove that—

a. The three pairs of corresponding vertices divide equianharmonically the three segments determined on their lines of connexion by the centre and axis of perspective.

a'. The three pairs of corresponding sides divide equianharmonically the three angles determined at their three points of intersection by the axis and centre of perspective.

b. The centre is the pole of the axis of perspective with respect to the vertices of both triangles for the same system of multiples.

b'. The axis is the polar of the centre of perspective with respect to the sides of both triangles for the same system of multiples.

6. For any two figures in perspective prove that—

a. Every two corresponding points divide in a constant anharmonic ratio the segment determined on their line of connexion by the centre and axis of perspective.

a'. Every two corresponding lines divide in a constant anharmonic ratio the angle determined at their point of intersection by the axis and centre of perspective.

7. When two circles intersect at right angles, prove the following polar properties of their centres and axes of perspective—

a. The pole of either axis of perspective with respect to either circle is the pole of the other axis of perspective with respect to the other circle.

a'. The polar of either centre of perspective with respect to either circle is the polar of the other centre of perspective with respect to the other circle.

b. Every two points of either circle which connect through a pole of either axis of perspective are conjugate points with respect to the other circle.

b'. Every two tangents to either circle which intersect on a polar of either centre of perspective are conjugate lines with respect to the other circle.

8. If X , Y , Z be any three collinear points on the three sides BC , CA , AB of any triangle ABC , show that—

a. The three circles on the three lines AX , BY , CZ as diameters are coaxial.

b. The three intersections of perpendiculars of the three triangles YAZ , ZBX , XCX are on their radical axis.

c. The three polar circles of the three triangles YAZ , ZBX , XCX are coaxial.

d. The three middle points of the three lines AX , BY , CZ are on their radical axis.

9. If A, B, C be any three circles, and X, Y, Z three others connected with them by the relations that X is coaxial with B and C, Y with C and A, Z with A and B, prove that—

a. The three circles X, Y, Z have the same radical centre and the same orthogonal circle with the three A, B, C.

b. When they pass through a common point they pass also through a second, the inverse of the first with respect to the circle orthogonal to A, B, C.

c. When their centres are collinear, they are themselves coaxial.

10. If A, B, C be any three circles, X and X' the two circles of inversion, external and internal, of B and C, Y and Y' the two of C and A, Z and Z' the two of A and B, prove that—

a. The four groups of three circles, XY'Z', YZ'X', ZX'Y', and XYZ are coaxial.

b. The limiting points, real or imaginary, of each group are the intersections of its line of centres with the circle orthogonal to A, B, C.

c. The common points, imaginary or real, of each group are inverse at once to their line of centres and to the circle orthogonal to A, B, C.

11. Prove the following reciprocal properties of homographic division ;—

a. A variable line intersecting two fixed lines homographically intersects every two positions of itself equihomographically.

a'. A variable point subtending two fixed points homographically subtends every two positions of itself equihomographically.

b. The variable intercepted segment in the former case subtends two constant angles at two fixed points (always real).

b'. The variable subtended angle in the latter case intercepts two constant segments on two fixed lines (sometimes imaginary).

12. Prove the following reciprocal cases of involution :—

a. The three sides of every triangle and every three concurrent lines through its three vertices intersect every axis in six points in involution.

a'. The three vertices of every triangle and every three collinear points on its three sides subtend every vertex in six rays in involution.

b. The six perpendiculars on the six lines from any point in the former case determine at the point a pencil of six rays in involution.

b'. The six perpendiculars from the six points upon any line in the latter case determine on the line a system of six points in involution.

Classical Sizarships.

HOMER AND EURIPIDES.

DR. WEBB.

Translate the following passages into English :—

1. *Beginning*, Πάτροκλος δ' ἔπετο, σφιδανὸν Δαναοῖσι κελεύων, κ. τ. λ.

Ending, ὥς ἔπποι Τρωαὶ μεγάλα στενάχοντο θίουσαι.

HOMER, *Iliad*, lib. xvi. 372-393.

2. *Beginning*, ἦν περ γὰρ πόλεμόν γε φύγη πολὺ δακρυὶν Ἀχαιῶν, κ. τ. λ.
Ending, Ἀστυάναξ, ὃν Τρῶες ἐπικλήσιν καλέουσιν.
Ibid., lib. xxii. 487-506.
3. *Beginning*, ὦ θύγατερ, οὐκ οἶδ' εἰς ὅ, τι βλέψω κακῶν, κ. τ. λ.
Ending, οἶδεν τό γ' αἰσχρὸν, κανόνι τοῦ καλοῦ μαθῶν.
 EURIPIDES, *Hecuba*, 583-600.
4. *Beginning*, οὐ νῦν με πρῶτον, ἀλλὰ πολλάκις, Κρέον, κ. τ. λ.
Ending, καὶ νῦν τὸ μὲν σὸν οὐ φθονῶ καλῶς ἔχειν.
 EURIPIDES, *Medea*, 294-313.
5. *Beginning*, ὁ μέγας ὄλβος, ἃ τ' ἀρετὰ, κ. τ. λ.
Ending, τρώων παθίων ἀμοιβάν.
 EURIPIDES, *Orestes*, 797-833.

XENOPHON AND DEMOSTHENES.

MR. POOLE.

Translate the following passages into English prose:—

1. *Beginning*, Προϊόντες δέ, ἐπεὶ ἐγένοντο οἱ ἡγούμενοι, κ. τ. λ.
Ending, δεομένους ὑμᾶς εἰς ἀνδρείότητα, ἀλλὰ σωτηρίας.
 XENOPHON, *Exped. Cyri*, lib. vi. c. 3.
2. *Beginning*, Καὶ πρῶτον μὲν ἀμελήσαντες τοῦ εἰς ἑκαίδεκα, κ. τ. λ.
Ending, τό ὑπερέχον ἐπικάμψαντες εἰς κύκλωσιν.
Ibid., *Hist. Græcæ*, lib. iv. c. 2.
3. *Beginning*, “Καὶ σέ γε διδάξων,” ἔφη, “ῥορμημαί, ὅτι, κ. τ. λ.
Ending, καταπεφρονήκοσιν ὅκνεῖς λέγειν, δεδιῶς μὴ καταγελασθῆς;”
Ibid., *Memorabilia*, lib. iii. c. 7.
4. *Beginning*, Καὶ δὴ καὶ νῦν τῷ Διοπίθει στρατεύμ' ἔχοντι, κ. τ. λ.
Ending, μικρὸν πινάκιον ταῦτα πάντα κωλύσαι δύναται' ἂν.
 DEMOSTHENES, *De Chersoneso*, p. 96.
5. *Beginning*, Ἀνάγκη δὴ πού τοὺς λόγους τούτους Αἰσχίνην, κ. τ. λ.
Ending, ὧν οὐδεὶς οὐδὲν ἡδίκηται ἰδίᾳ δὴ πού.
Ibid., *De Falsa Legatione*, p. 373.

HORACE.—VIRGIL.—TERENCE.

DR. SHAW.

Translate the following passages, writing brief notes on the words in italics:—

1. *Beginning*, Jam pauca aratro jugera regiæ :
Ending, Porticus excipiebat Arcton.
 HORACE, *Od.* ii. 15.
2. *Beginning*, Reges dicuntur multis urgere culullis
Ending, Et male tornatos incudi reddere versus.
 HORACE, *Ars Poet.*, 434-441.

3. *Beginning, Men.* Cur non, Mopse, boni quoniam convenimus ambo, ...
Ending, Sylvestris raris sparsit labrusca racemis.

VIRGIL, *Ec.*

4. *Beginning, Chr.* Revertor, postquam, quæ opus fuere ad nuptias....
Ending, Ut fert natura, facias, an de industria?

TERENCE, *Andria*, act iv. sc. 5.

Translate and explain the following Horatian phrases:—

Mæonii carminis alite.—Cadum Marsi memorem duelli. Agentia verba Lycamben.—Marsya te voltum ferre negat Noviorum posse minoris.—Levis Agyiea.—Dicitur Platus ad exemplar Siculi properare Epicharmi.—Pontica pinus. Othone contempto.—Ad ipsum Threx erit.—Thyna merce beatum.—Cum Velabro omne macellum.

Translate the following Terentian phrases into colloquial English:—

Mansum oportuit.—Me indicente hæc non fiunt.—Utinam tibi commitigari videam sandalio caput.—Hera in crimen veniet.—Si libitum fuerit, causam ceperit, quo jure, quaque injuria, præcipitem me in pistrium dabit.—Cyathos sorbillans paulatim hunc producam diem. Habet hæc ei quod, dum vivat, usque ad aurem obganniat.—Dare in sumptum.—Omissiones ab re ne sint, metuas.—Obsonare cum fide.

MR. ABBOTT.

Translate the following passages into English:—

1. *Beginning, Quemadmodum bellum minore, quam timuerant,.....*
Ending, sine certamine ingenti redit.
 LIVY, lib. iv. c. 43.
2. *Beginning, Ob ea infensus consulibus senatus,.....*
Ending, minus in prætura tendente.
 Ibid., lib. viii. c. 15.
3. *Beginning, Aut hoc judicium reprehendas tu,.....*
Ending, pluribus verbis docere non debeo.
 CICERO, *Pro Clurutio*, c. 41.
4. *Beginning, Venio nunc ad Dorylensium testimonium:.....*
Ending, nobilissimum civem vindicetis.
 Ibid., *Pro Flacco*, c. 17.

DR. INGRAM.

Translate the following passage into Greek Prose:—

Beginning, I am very much pleased with a consolatory letter of Phalaris,...
Ending, You must first see us die, said he, before that question can be answered.

ADDISON, *Spectator*, No. 349.

Translate the following passage into Greek Trimeter Iambics :—

Beginning, Iphigenia. Conclude the tale....

Ending, And lives Electra, too?

From GOETHE, Iphigenia in Tauris, act ii. sc. 1.

DR. DICKSON.

Translate the following passage into Latin Verse :—

Beginning, The more we live, more brief appear....

Ending, Proportion'd to their sweetness.

CAMPBELL, The River of Life.

Translate the following passage into Latin Prose :—

Beginning, No hero of ancient or modern days can surpass....

Ending, to witness that he dies without a groan.

IRVING, The Sketch-book—Traits of Indian Character.

LATIN HISTORY, GEOGRAPHY, AND GRAMMAR.

MR. FERRAR.

1. Who were the *Senatores Pedarii* and the *Quæstores Classici*?
2. What were the duties of the censors, and what checks were imposed upon them?
3. Show that the constitution of Servius was formed on an Hellenic model.
4. Sketch the campaigns of Cæsar in Greece and Spain.
5. Give a short account of the Perusian War.
6. Who were the contending parties in the battles of *Asculum*, *Aquæ Sextiæ*, and *Thapsus*?
7. With what measure did Camillus begin his censorship?
8. What fact in Roman history is proved by the origin of the words, *calx*, *machina*, *groma*, and *clathri*?
9. What is the origin of the word *vates*? Give some other words in the Latin language drawn from the same source.
10. Explain the formation of the words, *ussi*, *gessi*, *sero* (*sevi*), *vidi*, *pegi*, *Tarentum*, *statera*, and *placenta*.
11. How are questions expressed in the *oratio obliqua*?
12. Why is the accusative used with the infinitive?
13. What is the construction of *opus*?
14. Draw a map of Sicily, marking the chief towns along the coast, and giving their modern names.
15. Give the ancient and modern names of the chief rivers of Spain.

MR. GRAY.

1. Mention the chief ties which bound the Greeks together.
2. Give an account of the Ionic revolt.
3. Explain accurately the nature and object of Ostracism.
4. Mention briefly the principal events from the battle of Eurymedon to the thirty years' truce.
5. Mention the events from the battle of Cnidus to the peace of Antalcidas.
6. Decline *λαγώς*, *αἰδώς*, *ἐχθίων*.
7. What are the meanings of the different tenses of the verb ἵστημι?
8. Write out in full a paradigm of the verbs εἶμι, and ἵημι.
9. When does the relative agree with its antecedent in case?
10. Distinguish between *παρὰ σοῦ*, *παρὰ σοί*, and *παρὰ σέ*.
11. With what parts of the verb does *ἄν* never occur?
12. Name in order, beginning from the most western, the divisions of central Greece.
13. Where were the following towns:—Pagasæ, Byzantium, Pylus, Larissa, Eleusis, Potidæa, Eretria, Naupactus, Amyclæ?
14. Where were the rivers—Achelous, Halys, Eurotas, Mæander, Peneus, Alpheus, Hebrus?
15. Where were the mountains—Parnes, Taygetus, Othrys, Erymanthus, Pindus, Oeta?

ENGLISH LANGUAGE AND COMPOSITION.

MR. BARLOW.

1. Assign derivations for any of the following words:—Climate, gossip, palfrey, hide, pedlar, pelican, prodigious, prose, reputation, steward, stratagem, tadpole.
2. To what historical events may the origin and present signification of the following words be ascribed:—Assassin, caitiff, poltroon, saunterer, dunce, bigot?
3. "In a vast number of instances a word lives on as a verb, but has ceased to be employed as a noun—or, with a reversed fortune, it lives on as a noun, but has perished as a verb—or, again, the affirmative remains, but the negative is gone—or, once more, with a curious variation from this, the negative survives, while the affirmative is gone." Give two or three examples of each of these cases.
4. Spell the following words so as to indicate their etymologies:—Diamond, grocer, woodbine, scent, whole, afraid, country-dance, necromancy.
5. Meaning of the word *trivial* in the following quotation:—"Æquitas optimo cuique notissima, is a trivial saying, A very good man cannot be ignorant of equity."
6. Write a short essay on the lines—
 "Strange cozenage! None would live past years again;
 Yet all hope pleasure in what yet remain;
 And from the dregs of life think to receive
 What the first sprightly running could not give."
 Or, compare the character of King James II. with that of his father.

Irish Sizarship.

PROFESSOR O'MAHONY.

Translate the following passage from Greek into Irish :—

1. Matt. xxviii. 12-20.

Translate the following passages from English into Irish :—

2. Mark, xvi. 9-18.
3. *Beginning*, It is quite a mistake to suppose that the difficulty . . .
Ending, a less decisive proof that the Christian religion is from God.
Introductory Lessons on Christian Evidences—Less. vii. sec. 2.

Translate the following passages from Irish into English :—

1. Luke, xviii. 1-8.
2. Rom. xv. 23-29.
3. Aodh Oirbnuib do tionól ríóig lánmhóir do dol i Laigniú, 7 Laigniú páruccab fo dí a naon mhí. Do ronaib léiritiúnól fep nEpeann do ríóirí leir (cenmóat Laigniú), eirir laodair 7 cléir-óib, go ríadé Dun Cuair, i coiccríob Míde 7 Laignean. Támic ann Connmac, comarba Pátraice, co cléirí Leite Cuinn imaille fíur. Ní bó maré lar na cléiríob eóde fop ríóigead iur Agampíot a nimneab fíur an ríó. Arberc dín an rí, no gébáb amail acbéraib fíotab na Canoine, comí anó rúccríbe an mbreic, dia no íaop cléiríó Epeann fop feadé 7 ríóigead do gíer, co neperc;

Ecclai De dí, léico dí, na ríat,
 bíb a ceart fop leat, feb ar deab no baol.
 Gáb fíop mánaó fí, fop a óubair nglan,
 Don eacclai dían dí gíob amail gáb mób.
 Gáb dílmam íar rín, fí gán necht gán péir
 Ceat cia teir fí bái gáda máir míc Néill.
 A rí an ríagail cért, feó ní móir ní becc,
 Fígnab cad a mób, gán on gann ecc.

Annals of the Four Masters, 1st div., vol. i., p. 408.

1. On what grounds can the claims of the Irish to be regarded as belonging to the Indo-European family of languages be maintained?
2. What work in recent times has tended most to settle the question of the relationship of Irish to the other living Celtic dialects, and of the Celtic languages in general to the other members of the Indo-European family?
3. Explain how it has happened that Continental scholars have had advantages for the study of the ancient Irish not possessed by our best scholars at home.

4. Into how many stages may the Irish language as it is now known be divided, and what works may be considered as representing the earlier stages?

5. What are the *peculiar* features of the Irish language, and how may they be accounted for?

6. What changes are caused by the article in the initials of nouns generally, and in what circumstances does it cause no change?

7. What influence has the possessive pronoun *a* on the initials of nouns, and how has the difference of influence according to gender and number been accounted for?

8. Conjugate affirmatively, negatively, and interrogatively, the verb *faḡ*.

9. Translate the following sentences:—

(a.) *At cōda mian mná ceatpáó.*

(b.) *Ocup naḡa cāfnic pop calmáin fín po b'fepp blar na bpíḡ ḡap leo, mār.*

(c.) *Ro fúib in Coimbiu ceó ní pecmatc a lep.*

10. Give the simple and idiomatic meanings of the preposition *fa*, *fo*, or *paol*.

11. Mention the most usual ways of compounding words in Irish, and give examples.

12. What are the general rules for the concord and government of the verb?

HEBREW EXAMINATION, AND THE PRIMATE'S PRIZES.

SENIOR CLASS.

ISAIAH, I.—V., AND XL.—LIII.

DR. CARSON.

Translate the following passages accurately, making brief notes on the unusual words and phrases:—

I.

ביום ההוא יהיה צמח דוד ויהי חקור ויהי חקור ויהי חקור ויהי חקור ויהי חקור
 ישראל: והיה: והנשא ציון והנותר בירושלם קדוש יאמר לו כל הנתב ליהם
 בירושלם: אם: רחץ ידיו ואת צאת בנות ציון ואת דמי ירושלם יהיה כשפחה
 ברחם כששם וברחה בשר: וברא יהוה על כל סכנו ורציון ועל מקראה עגן: ויסם
 ועשן ונמה אש להבה לגולה כי על כל בבור חסה: וספה קדוה לצדיקים כחורג
 למחסה למסכור מרגם וספסור:

II.

אֲנִי יְהוָה צְבֹאֹת אִם-לֹא בָתִּים רַבִּים לְשִׁפְחָה יִהְיֶה וְזֵלִים וְשׂוֹגִים מֵאֵן יִשָּׁב : פִּי
עֲשֶׂרְתָּ צִמְד־לָרֶם יַעֲשֶׂה בַת אֲחֻזָּה וְזֶרַע חֶסֶד יַעֲשֶׂה אִמָּה : הֵיוּ מִשְׁפִּימִי בְּבֶקֶר
שֶׁסֶר יִדְּשׁ מִאֲחֻזִּי בְּנִשְׁף גֵּן יִדְּלִיקָם : וְהִיא כְּזֹר וְנָבֵל תִּהְיֶה וְהָלֵל גֵּן מִשְׁפִּיתָם
וְהָאֵת פֶּלַע יִהְיֶה לֹא יֵבִישׁ וּמַעֲשֶׂה יָדָיו לֹא רָאָה : לֵבָן גִּלְגָּל עִמָּי מִבְּלִיַּעַת וּבְכוּדֹי
מִתֵּי רָעָב וְהַמֹּטֵל צִוְּהָ צָמָה : לֵבָן הַחֲדָשָׁה שְׂמֹאל נִפְשָׁה וּקְשָׁה קִידָה לְבִלְיָה
וְיִדֵּי חֲדָשָׁה וְהַמֹּטֵל וְשִׂמְלָה וְעֵלֵי בָה :

III.

כִּי הַעֵד מִפְּנֵי צֶדֶק יִתְחַדֵּשׁ לְהִלְלֵי יָמֵן לְפָנֵי זֵלִים וּמַלְכִּים יִהְיֶה יָמֵן מַעֲשֵׂי חֲדָשָׁה
מַעֲשֵׂי בְהֵם קִשְׁתִּי : יִדְּשֶׁם יַעֲבֹד שְׁלֹמֹה אֲחִי בְּרִגְלָיו לֹא יָבֹא : מִרְשָׁעִי וְעֲשֶׂה כְרָמִי
וְהִזְרֹת מִרְאֵשׁ אֲנִי יִהְיֶה הַמֶּטֶן וְהַמִּדְּוָנִים אֲבִידוּם : רָצָה אֵימִם וְיִרְאָה קִצּוֹת
וְהַמֶּטֶן יִתְחַדֵּשׁ קִרְבִּי וְנִחְמָדָן : אֵלֶּשׁ אֲתִרְשָׁה יַעֲזֹר הַלְּחָדִי יִאֲמֹר חֲזָק : וְהַחֲזָק
תִּרְשֵׁ אֲתִרְשָׁה מִחֲזָק פֶּשַׁע אֲתִרְשֶׁל פֶּשַׁע אֲמִיד לְבָבְךָ מִיֵּבֶשׁ הוּא וְהַחֲזָקָה
בְּמִסְמָרִים לֹא יִסָּמֵם : וְהַמֶּטֶן יִשְׁחָל עֲבָדִי יִשְׁלַב אֲשֶׁר בְּחִתְיָהוּ וְזֶרַע אֲבִידוּם
אֲהַבִּי :

IV.

מִיָּדָה צָאֵה וְאֵן אֵלֶּשׁ קִרְבִּי וְאֵן עֹנֶה הַקְצֹר קִצְצָה דִּל מִשְׁחָה וְהֵם אֲחִרָבִי
כֹחַ לְהַחֲלִל הֵן בְּנִשְׁחָלִי אֲחִירָבִי יֵם אֲשִׁים תְּרוֹחַת מִדְּרֵי הַמֶּטֶשׁ דִּעְתָּם מֵאֵן מִים
וְחִסָּה בְּצָמָה : אֲלֵגִישׁ שְׂמִים קִדְחָה וְשֶׁק אֲשִׁים נִסְתָּם : אֲלֵגִי יִהְיֶה גִתִּן לִי לְשֹׁן
לְפִיזִים לְרִעַת לֵעֵשׂ אֲתִרְשָׁה בְּבֶר יַעֲדִי בְּבֶקֶר בְּבֶקֶר יַעֲדִי לִי אֲנִי לְשִׁמְעֵי פִלְמִזִּים :
אֲלֵגִי יִהְיֶה פִתְחֵלִי אֲנִי וְאֲלֵגִי לֹא מִרְיָה אֲחִירָבִי לֹא נִסְתָּה : זֵלִי נִתְחַי לְמַלְכִּים
אֲלֵגִי לְקִדְשִׁים פֶּלַע לֹא הִסְתָּהִי מִכְּלִמֹּת חֶק : וְאֲלֵגִי יִהְיֶה יַעֲזֹר לִי עֲלֵי לֹא
וּבְלִמְתִּי עֲלֵי לֹא שְׂמִי מִלִּי מִדְּמִישׁ וְאֲדַע פִּירָא אֲבוֹשׁ : קִרְבִּי מִצְדִּיק מִרְיָב אֲנִי
נִעֲמָה יִהְיֶה מִרְבֵּעַל מִשְׁפָּטִי יֵשׁ אֵלִי :

1. Give a brief account of the different theories that have been proposed for the interpretation of the fifty-third chapter of Isaiah.
2. Mention some of the internal proofs that the later chapters of Isaiah could not have been written in Babylonia, as modern Rationalists assert.
3. What portions of Isaiah are quoted or referred to by other prophetic writers?
4. Mention the principal quotations from Isaiah which are to be found in the New Testament.
5. What proof do these quotations furnish of the unity of authorship of the earlier and later prophecies of Isaiah?

Translate the following passage of the Vulgate into Hebrew :—

1. In die illa cantabitur canticum istud in terra Juda: Urbs fortitudinis nostræ Sion salvator, ponetur in ea murus et antemurale.
2. Aperite portas, et ingrediatur gens justa, custodiens veritatem.
3. Vetus error abiit: servabis pacem: pacem quia in te speravimus.
4. Sperastis in Domino in sæculis æternis, in Domino Deo forti in perpetuum.
5. Quia incurvabit habitantes in excelso, civitatem sublimem humiliabit.
6. Conculcabit eam pes, pedes pauperis, gressus egenorum.
7. Semita justi recta est, rectus callis justi ad ambulandum.
8. Et in semita judiciorum tuorum, Domine, sustinuimus te: nomen tuum et memoriale tuum in desiderio animæ.
9. Anima mea desideravit te in nocte; sed in Spiritu meo in præcordiis meis de mane vigilabo ad te.
10. Cum feceris judicia tua in terra, justitiam discent habitatores orbis.

MR. LONGFIELD.

1. Examine the different opinions which have been maintained as to the origin of the name *Hebrew*.
2. What evidence is there that the language of Canaan at the time of the call of Abraham was substantially the same as the Biblical Hebrew?
3. It has been said that the application of the term עִבְרִי to the Hebrew language, Isaiah, xxxvi. 11-13, indicates an author later than Isaiah. Examine this argument.
4. Explain the terms כָּתָב קֶדֶשׁ and כָּתָב עַמִּי applied to Hebrew writing. State the chief reasons for concluding that the change to the present square Hebrew character must already have taken place in the age before Christ.
5. Notice the chief differences between the vocalisation of the LXX. translators and that of the Masorets.
6. Write out the Hebrew Alphabet in the Rabbinical character.
7. What are the different kinds of parallelism in Hebrew poetry? Give an example of each kind.
8. What apology does Jerome offer for the inaccuracy of the LXX. version of Isaiah?

MIDDLE CLASS.

PSALMS, I.-XLI.

DR. CARSON.

- A.—1. What are the Hebrew names of the three divisions of the Jewish Scriptures, and what books are included in each class? This classification is expressly recognised in the New Testament?

2. Τό ψαλτήριον διεῖλον εἰς πέντε βιβλία οἱ Ἑβραῖοι ὥστε εἶναι καὶ αὐτὸ ἄλλην πεντάτευχον. This statement of Epiphanius is open to some objections? What other theory has been proposed for the fivefold division of the Book of Psalms?

3. Two Psalms are ascribed to David in the Old Testament, and two in the New, which have not the name of David prefixed to them in the present Hebrew titles?

4. In the Talmud the name מנצח מנצח is given to several of the Psalms; what is the signification of this phrase?

5. What portions of the Book of Psalms are repeated, either in the Psalter itself, or in other parts of the Old Testament?

6. Explain briefly the following expressions in the titles of the Psalms :
שמיני, שני, חליל, חן, נח, נח, נח.

B.—1. Ps. ii. 9, 12

הָרַעַם בַּשָּׁמַיִם בָּחַל כְּלִי יֶזַע תִּנְשָׁא :

נִשְׁקַע בְּרִי סָן יִאָקֵף וְהִאֲבִידוּ דָּךְ כִּי יִבֶּשׂ כְּמַעַשׂ אֲנִי

אֲשֶׁר כָּל חֹזֵק בּוֹ :

a. Affix the points and accents, and translate. The LXX. translation of v. 9 differs from the present Masoretic pointing? In what part of the New Testament is this verse applied to our Lord?

b. How is נִשְׁקַע rendered by the LXX., Vulgate, and Jerome? The translation given for נִ in the Authorized Version may be justified by what other Hebrew passage, where this word must be so rendered?

2. Ps. iv. 7.

רִבִּים אֲמַרְסִי מִי יִדְמֵנוּ שֹׁבִי

נִסָּה עָלַי אִדּוּ אִדּוּ פִּנְךָ יְהוָה :

a. Translate: how is the first clause of the verse explained by R. D. Kimchi, in connexion with the words בְּבִרְדּוֹ מִסִּי אֲבַשְׁלִים בּוֹ which occur in the title of the previous Psalm?

b. The meaning and grammatical form of נִסָּה have been variously explained? The LXX. translation is ἐσημειώθη: what pointing and derivation does this suggest?

c. Translate the following note of Aben Ezra on this word:—

וְכֵן לְדִוְתָא דְהָאָה כְּמוֹ הָאָה וְהָאָה כְּמוֹ הָאָה עַל דְּרַד יִשָּׁא יִשָּׁא י' פָּנִי אֵלֶךְ וְכֵן

הָאָה דְּבִי אֵלֶךְ תְּלָא :

3. Ps. xi. 1.

בִּיהוָה חֲסִידֵי אֵךְ וְהִאֲבִידוּ לִנְשָׁךְ

נִדּוּ הִרְכִּם צִפּוֹר :

a. Translate. What is the LXX. rendering of this verse?

b. The Masoretic text as it stands involves two violations of concord? The marginal reading removes only one of these?

c. What method was proposed by Dr. Wall for bringing the Hebrew text and LXX. into agreement?

4. Ps. xi. 6, 7.

יִמְסֹר עַל רַשָּׁעִים פִּדְיָם

אֵשׁ וְתַפְחִית וְרָחַח לְעִשְׂתּוֹ מִנֵּה נִסְסִים :

כִּי צָדִיק יִהְיֶה צֹדֵקוֹת אֲדֹב יִשָּׁר יְהוָה פִּנְקִיו :

a. Translate these verses accurately. Various meanings and derivations have been assigned for **לַעֲמֹד**? In what other passage of the Psalms does this word occur?

b. The suffix in **מֵיָדָי** has given rise to some difficulty? This suffix has a singular meaning as early as the book of Genesis?

5. Ps. xix. 14. גַּם מַדְמִים חֶשֶׁךְ עֵבֶךְ אֶל יִשְׁעוֹ בִּי אֵין אִיָּהֶם
וְנִקְיָה מִסַּעַר רֶגֶל :

a. Affix the points and translate. Two meanings have been proposed for **מַדְמִים**? In what signification is the word elsewhere used?

b. The LXX. translate the first clause of the verse *καὶ ἀπὸ ἀλλοτρίων φεῖσαι τοῦ δούλου σου*: how did they arrive at this meaning?

6. Ps. xxii. 30. אֲמָלוּ וַיִּשְׁחָדּוּוּ כָל דַּשְׁנִי אֶרֶץ לַעֲבֹד יִשְׂרָאֵל כָּל יוֹרֵד עֶשֶׂר
וְנִשְׁעוּ לֹא חֶזֶק :

Translate and explain this verse. What is the LXX. rendering of the last clause? and how should the present Masoretic text be changed, in order to admit of this rendering?

7. Ps. xxiv. 4, 6, 7. מִקֵּץ כְּסִים וְכֵן לִבִּי
אֲמַר לֹא נִשְׂאָ לִשְׂמָא נִשְׁעוּ וְלֹא נִשְׁבַּע לְמַדְמִים :
זֶה דָּרַךְ דְּרוֹשׁוֹ מִבְּקֵשִׁי פִנְךָ יַעֲקֹב :
שֶׁמָּה שְׂעִים רַחֲמִים וְהַנִּשְׁאָר פְּחָדִי עוֹלָם יִבְנֶה מֶלֶךְ הַבְּנוֹךְ :

a. Translate these verses. What are the marginal readings for **נִשְׁעוּ** and **דָּרַשׁ**? The first of these suggests the allusion to the Pentateuch contained in the 4th verse? How is this view supported by the similar use of **נִשְׁעוּ** in the prophetic writings?

b. What is Rosenmüller's interpretation of **יַעֲקֹב** in the sixth verse? He supports his interpretation by a passage of the prophet Isaiah?

c. The words **שְׂעִים** and **פְּחָדִי עוֹלָם**, if supposed to refer to the *temple*, as existing in the time of David, have given rise to some difficulty? Rosenmüller adopts the solution of the old Rabbinical commentators?

8. Ps. xxxi. 14. כִּי שִׁמְשִׁי דָּבַר רַבִּים מִגֹּד מִלְּבָבִי
בְּהוֹסֵם יָדוֹ עָלַי לִקְחָה נַפְשִׁי וּמָמוֹן :

a. Affix the points and translate. What was the LXX. rendering of **מִגֹּד מִלְּבָבִי**?

b. A remarkable application of these words was made by the prophet Jeremiah?

9. Ps. xxxv. 2, 3. הֲדַחַק מִנִּי רִצְוָה וְקוֹסֶה בְּעוֹדִי :
הֲדַחַק חַיַּית וְכֹרֶךְ לִקְחָה דַּשְׁנִי
אֲמַר לַנֶּפֶשׁ יִשְׁחָדּוּ אֵינִי :

Translate, and write a brief note on the words **מִן**, **צִדָּה**, and **מִן**. How was the last word explained by some of the Rabbinical commentators?

10. Ps. xli. 3, 4.

יְהוָה יִשְׁמְרוּ וַיְחַדְּדוּ אִמְרֵי בִרְיָ
וְהָלַל תִּהְיֶה בְּנֶפֶשׁ אִיבִי :
יְהוָה יִסְעֲדֵנוּ עַל עֵשׂ דָּו
כֹּל מִשְׁכְּנוֹ הַזֶּה בְּדֹלֵי :

Affix the points and translate. What is the marginal reading for **אִמְרֵי**?

11. A remarkable marginal reading on a verse of the sixteenth Psalm proves that the Masoretic revisers of the Hebrew text cannot be charged with dishonesty?

Translate the following passage into English:—

א שִׁיר מִסֹּדֶר לְבִירְסָה לְמַנְצָה עַל־מַחֲלֵת לַעֲוֹת מִשְׁפִּיל לְהִמָּן הָאֲדָרִי :
יְהוָה אֱלֹהֵי יִשְׁרָאֵל יוֹם־צִלְקָמִי בְּלִילָה נִגְדָּה :
תִּבְנֶה לִּפְנֵי הַמֶּלֶךְ הַפֶּה אֲנֹכָה לְדָוִד :
כִּי־שָׁבַעְתָּ בְּרַעְיוֹת נִסְאֵי יְהוָה לְשֹׁאֵל הַיָּעֵשׂ :
ה גִּחְשָׁנִי עִם־יְהוָה בֹּדַד יְהוָה בְּגִבֹּר אֶיךָ־אֵיל :
בַּמִּדְבָּר חָסֵי בְּמֵוָה וְחַלְלִים : שְׂכָרִי לִבִּי אֲשֶׁר לֹא־זָכַרְתִּים עַד וְחִפְּתָה מִיָּדִי
וְנָגַדְתִּי :
שְׁתִּי בְּבֹר הַחַיִּים בְּמִלְחָמָה בְּמִלְחָמָה :
עַל קִמְצָה חֲסִידָה וְכָל־מִשְׁפָּחָה עֲבִידָה סֵלָה :
דְּחַלְתָּה מִיָּדִי מִיָּדִי שְׁתִּי תִּשְׁלַח לִי לֵאמֹר וְלֹא אֶחָד :
י עֵינִי הִאֲבִיחָה מִיָּדִי עֵינִי עֲרִיבָה יְהוָה בְּלִילָה שְׁפָרְתִּי אֱלֹהֵי בְּרִי :
וְהַמִּדְבָּר תִּשְׁפָּחֵם אֲמִרְתָּם לֵאמֹר יְהוָה סֵלָה :
זִכְרֹנִי בְּקִרְבִּי חֲסִידָה וְכָל־מִשְׁפָּחָה בְּאֲבִדֹנִי :
חֲדָדְתָּ בְּחֵשֶׁךְ חֲדָדְתָּ בְּחֵשֶׁךְ בְּחֵשֶׁךְ בְּחֵשֶׁךְ :
וְאֵינִי אֱלֹהֵי יְהוָה שְׁפָרְתִּי וְכָל־מִשְׁפָּחָה חֲדָדְתָּ :
טו לִמָּה יְהוָה תִּפְגַּח נִסְאֵי חֲסִידָה שְׁפָרְתִּי מִיָּדִי :
עֵינִי אֵינִי וְגַם מִיָּדִי שְׁפָרְתִּי אֲמִירְתָּה חֲדָדְתָּ :
עַל עֲבָרִי יְהוָה חֲדָדְתָּ חֲדָדְתָּ :

סְבִיבִי בְּמִים בְּלִיָּהִים הָקִישׁוּ עָלַי יְהוָה :
הִרְחַקְתָּ מִפְּנֵי אֹהֶב וְרָצָה מִיָּדָעִי מִחֻשְׁדִּי :

Translate the following passage into Hebrew :—

Lamentations, iii. 22-36.

JUNIOR CLASS.

GENESIS.—SELECTED PORTIONS.

MR. POOLE.

1.—Ch. ii. 4, 5.

אֱלֹהִים תִּלְלוּתָהּ הַשָּׁמַיִם וְהָאָרֶץ בְּיוֹם עֲשׂוֹתָהּ יְהוָה אֱלֹהִים אֶרֶץ וְשָׁמַיִם :
וְכָל שִׁיחַ הַשָּׂדֶה טָרֶם יִהְיֶה בָּאָרֶץ וְכָל עֵשֶׂב הַשָּׂדֶה טָרֶם יֵצֵא בְּיָדָאֵל לֹא הָמְסִיר
יְהוָה אֱלֹהִים עַל הָאָרֶץ וְהָאָדָם אֵין לַעֲבֹד אֶת הָאָדָמָה :

a. Translate this passage. Different translations may be given according to the case in which שִׁיחַ is taken.

b. Explain the negatives טָרֶם and אֵין from the original meanings of the words; and state how they differ from each other.

2.—Ch. iv. 7.

הָיָה אִם-תִּמְסִיב שָׂאֵל וְאִם לֹא תִמְסִיב לִשְׂחָה תִּפְסָח וְיָבֵן וְאֵלֶיךָ תִּשְׁתָּקֵף וְתִתְּנָהּ
תְּמַשְׁלֵנִי :

a. Translate this passage; noticing a grammatical peculiarity.

b. A slight change in *two* words will give the LXX. translation *ἡμαρτες, ἡσυχασον*?

c. How does the Vulgate translate the words תִּשְׁתָּקֵף וְתִתְּנָהּ ?

3.—Ch. vi. 3.

וְיֹאמֶר יְהוָה לֹא-יִרְוֶן רִדְדוּ בְּאָדָם לְעֹלָם בְּשָׁנָם הָיָה בְּשָׁנָה רִדְדוּ יָמָיו מִכָּל
וְעֹשֶׂרֶם שָׁנָה :

a. Translate this passage, and give the LXX. version.

b. State the interpretations given for לֹא-יִרְוֶן and for בְּשָׁנָם, noticing the origin of the word בְּשָׁנָם according to each.

4.—Ch. viii. 10, 11.

וַיִּהְיֶה עוֹד שְׂבַע יָמִים אַחֲרָם וַיָּקֻץ שָׁלַח אֶדְוִיאָה מִן־הַמָּקוֹם : וְהָיָה אֵלָיו
הַיָּמָה לְעַתְּ לָרֹב וְהָיָה עֲלֵיהֶנּוּ פָקֶדָן בָּקֶדָ וַיִּקְרַע נָח דְּרָשָׁה הַפָּסִים מִכָּל דְּרָמָרָ :

a. Translate this passage.

b. Give an accurate account of all the verbs occurring in it, stating the moods and tenses.

c. How is the sense "recens" for פָקֶדָן to be explained?

5.—Ch. xxxvii. 18.

וַיֵּרָא אִתּוֹ מִדּוֹק וּבְמִדָּה יָקָב אֱלֹהִים וַיַּחְבְּלוּ אֹתוֹ לְהַמִּידוֹ :

Translate this passage, and add the vowel points.

6.—Ch. xlii. 16.

שָׁלוֹחַ מִכֶּם אַחֲרָי וַיִּקָּח אֶדְוִיאָהֶם וְהָיָה וַיִּבְרָחֵם דְּרָמָרָ הָאֶחָד אֶחָד
וְהָיָה לֹא דִי פִלְטָה בִּי מִדְּמָלִים אֶחָד :

a. Translate this passage.

b. Explain the verbs וַיִּקָּח, וַיִּבְרָחֵם, and their points; and analyze forms of וְהָיָה.

7.—Ch. xliv. 5.

וְהָיָה זֶה אֲשֶׁר יִשְׁמַע אֱלֹהֵי בֹו וְהָיָה נִחַשׁ נִחַשׁ בֹּו הַרְעָתָם אֲשֶׁר עָשִׂיהֶם :

Translate. State the verbs from which יִשְׁמַע, וְהָיָה are formed, and what tenses they are of those verbs; and the use of אֲשֶׁר in the commencement of the verse.

8.—Ch. xlv. 5.

וַעֲשֵׂה אֶל־הַעֲבֹד וְהָיָה בְּעֵינֶיכֶם כִּי־מִטְרָחַם אֹתוֹ הֵנָּה כִּי לְמַדָּה שְׁלֹחַ אֱלֹהִים
לְעֵינֶיכֶם :

Translate this passage; and add the vowel points.

9.—Ch. xlviii. 10.

וַיִּבְרָךְ יִשְׂרָאֵל בְּבָרְכוֹ מִבְּרָכָה לֹא יִבְרַךְ לְחַיָּה וַיִּבְרָךְ אֶת־הָאֱלֹהִים וַיִּשְׁקֶה לָהֶם וַיִּחַן לָהֶם :

Translate. Explain the forms of the verbs יִבְרַךְ and וַיִּשְׁקֶה.

10.—Ch. l. 19.

וַיִּמָּדֶר אֶל־הֶם יִשְׁאָל אֶל־הַיָּדָה בִּי הַיָּדָה אֱלֹהִים אֲנִי :

The translations in the LXX. and Vulgate of this verse differ from that in our version?

11.—Ch. xlix. 24.

וַיִּשְׁלַח בְּאֶתְרָם קִשְׁרוֹ וַיִּשְׁאָל וַיִּדְּרֵי מִדֵּי אֶבֶד יַעֲקֹב מִשָּׁם וַיִּשְׁאָל אֶת־יִשְׂרָאֵל :

14. Explain, with examples, the different modes of connecting the numerals from 2 to 10 with substantives.

15. How is a compound idea expressed by two substantives, the former in the construct state, made definite? When does an adjective, joined to a substantive, require the article? How does the sense differ according as ܐܢܝܢ is, or is not, followed by the article?

1. Daghes forte compensative usually marks the omission of a letter preceding that in which it is inserted. Give instances in which it compensates for a letter following that in which it is found.

2. Mark the position of the accent on the persons of the preterite Kal of a verb ܐܬܝܢ , e. g. ܐܬܝܢܐ .

3. What forms are identical in verbs ܐܬܝܢ and ܐܬܝܢ , and in verbs ܐܬܝܢ and ܐܬܝܢ ? In what classes of verbs is there no distinction of form between the future Kal and the future Hiphil?

4. Give instances of Chaldaisms, in the inflexion of nouns and verbs, occurring in Biblical Hebrew.

5. State, with examples, the different modes of construction which are used when two verbs, one completing the sense of the other, are employed to express one idea.

6. What are the modes of expressing the subjunctive and optative in Hebrew?

Translate into Hebrew the following passage:—

Gen. xxxii. 29, 30.

EXAMINATION FOR THE PRIZE IN SYRIAC.

MR. LONGFIELD.

1. What is the difference between *otiose* and *occult* letters in Syriac? Mention the principal cases in which letters are otiose.

2. Write down the definite plurals of the nouns ܐܬܝܢ , son; ܐܬܝܢܐ , sister; ܐܬܝܢܐ , beast; ܐܬܝܢܐ , place; ܐܬܝܢܐ , heart; ܐܬܝܢܐ , place; ܐܬܝܢܐ , name; ܐܬܝܢܐ , nation; ܐܬܝܢܐ , lip; ܐܬܝܢܐ , lion.

3. Give an example of each of the three different ways in which the plural may be formed in compound nouns.

בְּיָד תִּשְׁלַח מַלְאָכֶיךָ וְתִבְרָכְךָ כָּל
 אֲדָמָה ♦
 וְעַתָּה יְיָ אֱלֹהֵינוּ בְּרִכְּךָ מְלָכֵנוּ מְלָכֵנוּ
 חַיָּה ♦
 וְלִפְנֵי הַיָּדֵינוּ בְּרִכְּךָ תִּשְׁלַח מַלְאָכֶיךָ
 וְתִבְרָכְךָ כָּל אֲדָמָה ♦
 וְעַתָּה יְיָ אֱלֹהֵינוּ בְּרִכְּךָ מְלָכֵנוּ מְלָכֵנוּ
 חַיָּה ♦

ARCHBISHOP KING'S DIVINITY PRIZE EXAMINATION*.

JUNIOR CLASS.

ARCHBISHOP KING'S LECTURER.

1. How did S. Anselm, Bossuet, and Bishop Butler, respectively, state the argument from abstract reasoning for the existence of God?
2. How does Kant criticize the usual arguments on this subject? What argument does he himself adopt?
3. What are the different forms of Pantheism? Define the relative position of Mysticism.
4. Give an instance of the discrepancy that exists among "Egyptologists." How is their so-called science criticized by Sir G. C. Lewis?
5. State briefly how the family of the Herods attained power in Palestine; and distinguish between the different Herods spoken of in the New Testament.
6. Mr. Coleridge (in "The Friend") marks out different stages in "the Education of the World."
7. Give some account of the treatment of the Book of Daniel by the so-called "higher criticism" of modern days. How is this reasoning to be met?
8. Consider the question,—In what language did our Lord address his hearers? A speculation of Sir James Stephen, in the Epilogue to his essays on Ecclesiastical Biography, illustrates the importance of this question.

* The greater part of these Examinations is conducted *vis à voce*.

9. Point out the fallacy in Dr. Donaldson's argument impeaching the authenticity of the second Epistle of S. Peter, and of the Epistle of S. Jude.

10. The existence and growth of Christian civilization are to be reckoned among the evidences for revealed religion:—give the heads of this argument.

11. The failure of Philosophy to ascertain *a beginning* homogeneous with the present order of things, may be illustrated by the systems of Comte, Mr. Darwin, and the author of the "*Vestiges of Creation*."

12. What is the most recent decision of science as to the alleged spontaneous development of life, in the case of the *infusoria*?

13. Bishop Butler connects the question as to Miracles with the question as to Creation.

14. How would you answer the objection of Mr. F. Newman that the Bible sanctions and even enjoins things that shock the moral sense?

15. The advance of physical science has a tendency to strengthen rather than to weaken our conviction of the supernatural character of miracles?

16. Archbishop Whately reduces to syllogistic form Hume's argument against the value of testimony as a proof of miracles?

17. Contrast *Rationalism* and *Naturalism*.

18. Illustrate the mistake of attempting to draw a parallel between a miracle and a natural event.

19. Explain and illustrate (1) The "law" of Prophecy; (2) The "perspective" character of Prophecy; (3) "The double sense" of Prophecy.

20. Show how the evolution of doctrine differs from the theory of development.

21. Write a short note on the word "Person" as used in the doctrine of the Trinity; and explain the technical terms *ὑπόστασις*, *οὐσία*, *περὶ ἑωρησις*.

22. State the objections which seem to lie against Pearson's opinion as to the Logos of Philo.

23. Explain the notions of the *Memra*, the *Metatron*, and the *Adam-Kadmon*.

24. State the theological error, as well as the confusion of thought, which create the difficulty as to Our Lord's Eternal Sonship.

25. Divines distinguish three kinds of generation: in which sense only is Sonship *properly* applied to the Second Person of the Trinity?

26. How did the Adoptionist Heresy differ from that of Nestorius?

27. What erroneous opinion as to our Lord was attributed to "The Master of the Sentences"?

28. Quote the passages of Scripture which *expressly* make mention of *Imputation*. State the obvious result.

29. In Lev. xvi. exception has been taken to more than one passage in the English Version, as obscuring the account of the ceremony of the "Scape-Goat."

30. What are the different opinions as to the meaning of the word Azazel?

1. What various readings have the support of MSS. in the following passages :—S. Matt. xix. 17; Acts, ii. 47; xx. 28; xxvii. 14; Eph. v. 30; Col. ii. 2?

2. Give a brief statement of the arguments as to the genuineness of the received text of S. Mark, xvi.; and of Acts, viii. 36–39.

3. (a) Remark briefly on S. Paul's use of prepositions, as exemplified by such a text as Rom. iii. 22.

(b). Write a note with this view on Gal. ii. 16, as compared with Phil. iii. 9, and Col. ii. 12.

4. Distinguish between, and illustrate where necessary, the significations of the following words :—*οὐ, μή; ἕτερον, ἄλλο* (e.g. in Gal. i. 6, 7); *πλύνω, νίπτω, λούω; θεοσεβής, εὐσεβής, εὐλαβής, θρησκοῦς, δεισιδαιμονῶν; ἀληθής, ἀληθινός; Ἑβραῖος, Ἰουδαῖος, Ἰσραηλίτης.*

5. (a). State the force of *πᾶς* with and without the article; showing the sense, according to this rule, of the following passages :—S. Matt. ii. 3; viii. 34; Acts, ii. 36; Gal. vi. 6; Eph. iii. 15; Col. iv. 12.

(b). Write a special note on Eph. ii. 21; and illustrate this case by a well-known text.

6. Translate and comment *grammatically* on Gal. iv. 12–14; Eph. iv. 9; Col. i. 19; Eph. vi. 17, with special reference to the rule as to the gender and number of the relative pronoun, supplying further examples similar to Eph. i. 23, and Phil. i. 28.

7. Translate and explain Acts, xv. 20; Gal. v. 17; Col. ii. 20–23.

8. Write a brief note on each of the following passages :—S. Matt. ii. 23; xxiii. 35; S. Mark, xi. 13; S. John, xx. 21.

9. Translate and explain the words and phrases—*Ἀββᾶ, ὁ Πατήρ, Rom. viii. 15; ἐνεβριμήσατο τῷ πνεύματι, S. John, xi. 33; κατὰ τὸν ἔσω ἄνθρωπον, Rom. vii. 22; ἀνάθεμα ἔστω, Gal. i. 8; τὴν κατατομήν, Phil. iii. 2.*

10. Compare briefly :—S. John, xix. 14, and S. Mark, xv. 25; as well as the different accounts of S. Paul's conversion.

11. S. Paul employs three terms to express the redemptive agency of Christ; quote passages in which they respectively occur.

12. Develop, in the form of an essay, the doctrinal signification of Eph. i. 20–23; Phil. ii. 5–11; Col. i. 15–17.

BEDELL IRISH SCHOLARSHIP EXAMINATION.

PROFESSOR O'MAHONY.

Translate the following passages into Irish :—

Matt. v. 13–16.

Rom. xiii. 1–7.

1 Tim. vi. 13–17.

1. Write in Irish the fourteenth and twenty-eighth Articles, and give Scripture proofs thereof.
2. State briefly the *traditional* account as to the period when, and the persons by whom, the Irish letters were invented.
3. Whence is derived the most curious information respecting the literary character of Ireland before St. Patrick's time?
4. Give an account of the first *printed* Irish Grammar.
5. What are the peculiarities which distinguish the Erse, or Gaelic of Scotland, from Irish?
6. In what consists the principal difference between the Munster and the other dialects of the Irish language?
7. In what positions is the letter *s* not aspirated?
8. What are O'Donovan's particular rules for the formation of the genitive case plural of the second declension?
9. Conjugate the verb *ceidim*.
10. What are the simple and idiomatic meanings of the prepositions *o* and *pead*?
11. How may derivative substantives be classed according to their terminations?
12. Give an abstract of the rules for the government and collocation of pronouns.

SCHOOL OF ENGINEERING.

JUNIOR CLASS.

DR. SALMON.

1. Differentiate

$$\frac{x}{1+x} + \frac{3}{x\sqrt{x}} + 4x - x \log x.$$

2. Differentiate

$$\frac{5}{2} \tan^{-1} x - \frac{1}{4} \log \frac{x-1}{x+1},$$

and reduce the answer to a single fraction.

3. Expand by Maclaurin's theorem $e^x \cos x$.
4. When is $a \tan \theta + b \cot \theta$ a minimum?
5. Find the value of

$$\frac{e^x - x - \sqrt{1-x^2}}{1 - \cos x} \text{ when } x = 0.$$

6. Integrate

$$\frac{dx}{2x+3}, \frac{dx}{2x^2+9}, \frac{dx}{x^2+x+1}, \frac{dx}{\sqrt{x^2+x+1}}.$$

7. Construct the line of intersection of two planes both parallel to the ground line.

8. Construct the angle between two intersecting lines.

9. Draw a tangent plane to a cylinder from a given point outside it.

10. Draw a tangent to the helix parallel to a given plane.

1. Solve the system of equations,

$$\begin{aligned} x+y+z &= 10, \\ 2x-y+z &= 7, \\ x-y+3z &= 4. \end{aligned}$$

2. Find an angle whose tangent is four times its sine.

3. Find in degrees and minutes x from the equation

$$\sin(x+\theta) = 2 \sin x,$$

being given $\sin \theta = \frac{3}{4}$.

4. Being given $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$, $\tan C = \frac{1}{4}$; find the tangent of the sum of the three angles.

5. Find the three angles of the triangle whose sides are 854.692, 412.728, 656.212.

6. Find the base angles and base of a triangle whose sides are 1532.09, 1000, and contained angle 20° .

7. Calculate the logarithm of 2 in Napier's system.

8. Trace the curve

$$y = \frac{x+9}{x+1}.$$

CHEMISTRY AND MINERALOGY.

DR. APJOHN.

1. Explain the process for preparing oxygen from chlorate of potash; and calculate the weight of oxygen which one avoirdupois ounce of the salt should yield.

2. What is the precise action of muriatic acid on peroxide of manganese?

3. If a substance upon analysis was found to consist of—

Sulphuric acid, . . .	43.20
Alumina, ...	9.27
Potash, ...	8.46
Water, ...	38.88

99.81

how would you investigate its atomic constitution? and represent it by a formula?

4. What circumstance would enable you to conclude that a solution of chloride of calcium would decompose, and be decomposed by, one of phosphate of soda?

5. Give in symbols the reactions of the two salts just mentioned on each other.

6. Explain the constitution of a limestone which on being properly burned would yield a hydraulic mortar.

7. What are the salts which confer hardness on waters? Why, generally speaking, are hard waters partially softened by boiling?—and what is Clarke's process for determining the degree of hardness of a water?

8. Describe and explain the process for preparing liquid muriatic acid.

9. Describe and explain the process for procuring nitric acid.

10. How would you make an exact analysis of a mixture of oxygen, nitrogen, carbonic acid, and aqueous vapour?

11. Write the formula of felspar (orthose), and specify the differences between this mineral and albite.

12. What is the formula, and what the crystalline system, of the mineral called galena?—and how by chemical means would you demonstrate the nature of the metal which it includes?

13. Specify the two uniaxial systems, and give the crystallographic characters of each.

14. Give the notation of the octahedrons in the second and fourth systems.

15. Write the formulæ of common pyrites, of magnetic pyrites, and of mispickel; and mention the system in which each is found.

BISHOP LAW'S MATHEMATICAL PREMIUM.

SIR WILLIAM ROWAN HAMILTON.

A.

QUATERNIONS.

1. Let $A_1B_1, A_2B_2, \dots, A_nB_n$ be any given system of posited right lines, the $2n$ points being all given; and let their vector sum,

$$AB = A_1B_1 + A_2B_2 + \dots + A_nB_n,$$

be a line which does not vanish. Then a point H , and a scalar h , can be determined, which shall satisfy the quaternion equation,

$$HA_1 \cdot A_1B_1 + \dots + HA_n \cdot A_nB_n = h \cdot AB;$$

namely by assuming any origin O , and writing,

$$OH = V \frac{OA_1 \cdot A_1B_1 + \dots + OA_n \cdot A_nB_n}{A_1B_1 + \dots + A_nB_n}, \quad h = S \frac{OA_1 \cdot A_1B_1 + \dots}{A_1B_1 + \dots}.$$

2. For any assumed point C , let

$$QC = CA_1 \cdot A_1B_1 + \dots + CA_n \cdot A_nB_n;$$

then this quaternion sum may be transformed as follows,

$$QC = Q_H + CH \cdot AB = (h + CH) \cdot AB;$$

and therefore its tensor is,

$$TQC = (h^2 + \overline{CH}^2)^{\frac{1}{2}} \cdot \overline{AB},$$

in which $\overline{AB}$ and $\overline{CH}$ denote lengths.

3. The least value of this tensor TQC is obtained by placing the point C at H ; if then a quaternion be said to be a minimum when its tensor is such, we may write

$$\min. QC = Q_H = h \cdot AB;$$

so that this minimum of QC is a vector.

4. The equation,

$$TQC = c = \text{any scalar constant} > TQ_H,$$

expresses that the locus of the variable point C is a spheric surface, with its centre at the fixed point H , and with a radius r , or $\overline{CH}$, such that

$$r \cdot \overline{AB} = (TQC^2 - TQ_H^2)^{\frac{1}{2}} = (c^2 - h^2 \cdot \overline{AB}^2)^{\frac{1}{2}};$$

so that H , as being thus the common centre of a series of concentric spheres, determined by the given system of right lines, may be said to be the *Central Point*, or simply the *Centre*, of that System.

5. The equation,

$$TVQC = c_1 = \text{any scalar constant} > TQ_H,$$

represents a right cylinder, of which the radius $= (c_1^2 - h^2 \cdot \overline{AB}^2)^{\frac{1}{2}}$ divided by $\overline{AB}$, and of which the axis of revolution is the line,

$$VQC = Q_H = h \cdot AB;$$

wherefore this last right line, as being the common axis of a series of such right cylinders, may be called the *Central Axis* of the System.

6. The equation,

$$SQ_C = c_2 = \text{any scalar constant,}$$

represents a plane; and all such planes are parallel to the *Central Plane*, of which the equation is,

$$SQ_C = 0.$$

7. Prove that the central axis intersects the central plane perpendicularly, in the central point of the system.

8. When the n given vectors $A_1B_1, \dots A_nB_n$ are parallel, and are therefore proportional to n scalars, $b_1, \dots b_n$, the scalar h and the vector Q_H vanish; and the centre H is then determined by the equation,

$$b_1 \cdot HA_1 + b_2 \cdot HA_2 + \dots + b_n \cdot HA_n = 0,$$

or by the expression,

$$OH = \frac{b_1 \cdot OA_1 + \dots + b_n \cdot OA_n}{b_1 + \dots + b_n},$$

where O is again an arbitrary origin.

B.

DIFFERENTIAL EQUATIONS, AND ENVELOPES IN SPACE.

1. If ϕ, ψ, π be regarded as arbitrary functions of a variable α , the two equations,

$$\begin{aligned} (a) \dots (x - \phi)^2 + (y - \psi)^2 + (z - \pi)^2 &= \alpha^2, \\ (b) \dots (x - \phi) \phi' + (y - \psi) \psi' + (z - \pi) \pi' + \alpha &= 0, \end{aligned}$$

represent, by elimination of α , the envelope of a sphere of which the centre $\phi\psi\pi$ traverses an arbitrary curve in space, while its radius α varies, as has been shown by Monge^a, who also writes for abridgment,

$$(c) \dots 1 - \phi'^2 - \psi'^2 - \pi'^2 = h^2.$$

Prove that when Monge's quantity h is *real*, his envelope (a) (b) is *imaginary*; and that conversely his *radical* h is *imaginary*, precisely when that envelope (a) (b) of a sphere, with one varying parameter, is *real*.

2. When $h = 0$, the generally superficial envelope (a) (b) reduces itself to a *curve*, as its only real part, with the locus of the centre for an *evolute*.

3. When $h^2 < 0$, the two equations (a) (b), for any given and real value of α , represent a real circle, of which the real envelope of the sphere is the locus; and all such circles touch *two* generally distinct *cusp-edges*, or *two branches* of one cusp-edge, determined by the system of the three equations (a) (b) and

$$(d) \dots (x - \phi) \phi'' + (y - \psi) \psi'' + (z - \pi) \pi'' + h^2 = 0,$$

with the value (c) of h^2 .

^a Liouville's Edition, pages 369, &c.; or Fourth Edition (1809), pages 322, &c. An exponent, missing in both Editions, has been restored in the equation (c).

4. The co-ordinates xyz of a point of such a cusp-edge (a) (b) (d) contain a common radical, by equating which to zero Monge obtains the equation of condition,

(e) ... $[\alpha(\phi'\phi'' + \psi'\psi'' + \pi'\pi'') - h^2]^2 + h^2[\alpha^2(\phi''^2 + \psi''^2 + \pi''^2) - h^4] = 0$, as a differential equation of the second order and second degree, which must be satisfied by the three functions ϕ, ψ, π of α , in order that the two branches of the cusp-edge may coincide, or be confounded into one curve, which has then no longer a cuspidal character, but is still a *singular line* on the surface, which is as before the *envelope of the sphere*. Without actually calculating the radical last mentioned, show by geometrical considerations that Monge's equation (e) must admit of being otherwise obtained, as the result of the elimination of xyz between the three equations (a) (b) (d), and the following,

$$(f) \dots (x - \phi)(\psi'\pi'' - \pi'\psi'') + (y - \psi)(\pi'\phi'' - \phi'\pi'') \\ + (z - \pi)(\phi'\psi'' - \psi'\phi'') = 0,$$

which does not seem to have been noticed by him.

5. By treating xyz as functions of α , the four equations (a) (b) (d) (f) conduct to the three following,

$$(g) \dots (x - \phi)x' + (y - \psi)y' + (z - \pi)z' = 0,$$

$$(h) \dots (x - \phi)x'' + (y - \psi)y'' + (z - \pi)z'' + x'^2 + y'^2 + z'^2 = 0,$$

$$(i) \dots (x - \phi)x''' + (y - \psi)y''' + (z - \pi)z''' + 3(x'x'' + y'y'' + z'z'') = 0;$$

auxiliary relations being,

$$(j) \dots x'\phi' + y'\psi' + z'\pi' = 0,$$

$$(k) \dots x'\phi'' + y'\psi'' + z'\pi'' = 0,$$

$$(l) \dots x''\phi' + y''\psi' + z''\pi' = 0;$$

while (d) and (k) give also,

$$(m) \dots (x - \phi)\phi''' + (y - \psi)\psi''' + (z - \pi)\pi''' - 3(\phi'\phi'' + \psi'\psi'' + \pi'\pi'') = 0.$$

How does the new equation (f) assist in the deduction of (k)?

6. Conversely, the four equations (a) (b) (d) (m) give the three equations (g) (j) (k); and therefore, if we do not suppose that xyz are the co-ordinates abc of a fixed point, they conduct by elimination of $x'y'z'$ to the equation (f), and so to Monge's equation of condition (e); which thus expresses, generally, that four consecutive spheres of the series intersect in a common point xyz , namely in the point of the singular line (4).

7. Hence also, or from the four equations (a) (g) (h) (i), it may be inferred that any one sphere (a) of the series passes through four consecutive points of the same singular line; or in other words, that it is the *osculating sphere* to that *singular line* (4) at the point xyz .

8. The circle (a) (b) is therefore the *osculating circle* to the same line, at the same point; and accordingly the equations (j) (l) express, that the tangent to the curve (1) is perpendicular to the osculating plane to the singular line, as it ought to be, because that curve is by (7) the locus of the centres of the osculating spheres to that line (4), or the cusp-edge of its polar developable.

9. Conversely, the tangent to the singular line is perpendicular, by (j) and (k), to the osculating plane to the curve, in which plane by (f) the point xyz is situated; the line therefore crosses that plane at that point

perpendicularly: or, in other words, the singular line (4) of the envelope is an *orthogonal trajectory* to the *osculating planes* of the proposed curve (1), which curve is therefore seen again to be the cusp-edge of its polar developable.

10. If we change a in (b) to aa' , to represent that the radius a , and the co-ordinates of the centre of the sphere, are conceived, for greater generality, to be *all* functions of an independent variable t , we are then to change the term $+h^2$ in (d) to such an expression as the following,

$$(n) \dots + e = aa'' + a'^2 - \phi'^2 - \psi'^2 - \pi'^2;$$

and then if we write, for abridgment,

$$(o) \dots a = \phi'^2 + \psi'^2 + \pi'^2, \quad b = \phi'\phi'' + \psi'\psi'' + \pi'\pi'', \quad c = \phi''^2 + \psi''^2 + \pi''^2,$$

Monge's equation of condition (e) takes this more general form,

$$(p) \dots (ba^2 - eaa')^2 = (aa^2 - a^2a'^2)(ca^2 - e^2);$$

namely that of a *differential equation*, of the *second order* and *second degree*, wherein *four* variables, ϕ , ψ , π , and a^2 , are regarded as functions of a *fifth*.

11. The *complete* and *general integral* of this last equation (p) is expressed by the system of the *four* equations (a) (g) (h) (i), in which the *three* variables x , y , z are treated as *arbitrary functions* of the same independent variable t ; because we can return from this last system to (b) (j) (l), and thence to (d) and (k), with the new forms of (b) and (d); while (g) (j) (k) conduct, as before, by elimination of the ratios of $x'y'z'$, to (f); and thence, by elimination of xyz to the *extended form* (p) of Monge's equation (e).

12. In this integral system (a) (g) (h) (i), it is permitted to assume *any* variable, for example, z , instead of t , as that with respect to which the differentiations are to be performed, and so to write

$$z' = 1, \quad z'' = 0, \quad z''' = 0;$$

the complete and general integral of the *original* equation (e) depends therefore, in the last analysis, on only *two* arbitrary functions, such as those which determine the form and position of the line (4), considered now as an *arbitrary curve in space*, from which the co-ordinates ϕ , ψ , π of the curve (1) and the radius a can be deduced, by the formulæ for an *osculating sphere* (7).

13. A less general integral can however be found, which involves only *one* arbitrary function, corresponding to the case where the curve (1) is a *plane* one, and the spheres are all obliged to pass through a fixed point A in its plane: in which particular case, the *singular line* (4) reduces itself to the *singular point* A .

UNDERGRADUATE HONOR EXAMINATION PAPERS.

Michaelmas Term.

EXAMINATION FOR THE DEGREE OF BACHELOR OF ARTS.

Moderatorships in Mathematics and Mathematical Physics.

Examiners.

ANDREW SEARLE HART, LL. D.

JOHN H. JELLETT, M. A., Professor of Natural Philosophy.

GEORGE SALMON, D. D.

MICHAEL ROBERTS, M. A., Professor of Mathematics.

GEORGE F. SHAW, LL. D.

GEOMETRY.

DR. HART.

1. If several curves of the n^{th} degree pass through the same n^2 points, prove that the tangents at these points form homographic pencils.
2. Find the condition that the line $la + m\beta + n\gamma = 0$ should touch a given conic.
3. If a chord of a conic pass through a fixed point, prove that the product of the tangents of the halves of the angles which its segments subtend at the focus is constant.
4. Prove that every cubic which passes through the nine points of inflexion of a given cubic has the same points of inflexion.
5. If the foci of an oval of Cassini are the extremities of a diameter of an equilateral hyperbola, prove that the two curves cut one another at right angles.
6. If the distances of a variable point from the fixed lines OA , OB , and from the fixed point C , are denoted by α , β , and ρ , and if the constant k be so chosen that the cubic $\rho^3\alpha = k^2\beta$ may have a double point; prove—
1st. That this point will be a cusp when $3 \tan COB = \tan \frac{1}{2} COA$; 2nd. That if D be the cusp, $COA = 3COD$; and, 3rd. That a circle through C , D , and O will touch the cubic at the cusp.

7. If $\rho_1\rho_2\rho_3\rho_4$ are the distances of a variable point from four fixed points on a right line or a circle, show that a, b, c, d may be so determined that $a\rho_1 + b\rho_2 + c\rho_3 + d\rho_4 = 0$ for all positions of the variable point.

8. Prove that if the co-ordinates of the intersection of the line $z = 0$, with the polar line of any point with respect to the curve $U = 0$ be substituted in the equation of any higher polar of the same point, the result will be of the form $PU + Qz^2 = 0$.

9. Show how to compute P and Q in this equation, U being a given function of x, y , and z .

10. In transforming from trilinear to three point co-ordinates, and *vice versa*, show that there are three points which correspond to the same three lines in each transformation, and show in what respect one of these points differs from the two others.

DR. SALMON.

1. In determining a surface of the second degree, to how many conditions is it equivalent to be given a point and its polar plane? To how many to be given a self-conjugate tetrahedron?

2. The perpendiculars from each vertex of a tetrahedron on the opposite face are generators of the same hyperboloid?

3. Find the condition that it should be possible to draw to a surface of the second order—

(a). Three mutually rectangular asymptotic lines.

(b). Three mutually rectangular asymptotic planes.

4. Every equilateral hyperbola which passes through three fixed points passes through a fourth. Find an analogous theorem for surfaces.

5. Find the surface generated by the intersection of two mutually rectangular planes, each of which passes through a fixed line.

6. Find the equation of the cylinder generated by a line always parallel to $x = mz, y = nz$, and which meets the plane of xy in the curve

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$$

7. Find the lengths of the axes of a section of a quadric made by a plane making given angles with the axes of the surface.

8. Find the locus of points on a surface at which the two lines coincide, which can be drawn to meet the surface in three coincident points.

9. A double point on a surface will be also a double point on its Hessian?

10. Prove Meunier's theorem that the radius of curvature of an oblique section is the projection of the radius of curvature of a normal section.

11. The plane of two consecutive elements of a geodesic line contains the normal to the surface?

12. If A_1, A_2 be the minors obtained from a determinant Δ by erasing the first line and first and second columns; B_1, B_2 those obtained by erasing the second line and first and second columns; C the minor ob-

tained by erasing both first and second lines and columns; prove that $A_1B_2 - A_2B_1 = C\Delta$.

13. If x_1, x_2, x_3, x_4 be the roots of a biquadratic equation, and if the values of

$$x_1x_2 + x_3x_4, \quad x_1x_3 + x_2x_4, \quad x_1x_4 + x_2x_3,$$

have been found to be y_1, y_2, y_3 ; show how the roots of the biquadratic may be found. What other function of the roots having only three values may be used for the solution of the biquadratic by means of a cubic?

14. If $x_1, x_2, \dots$ are the roots of

$$a_0x^n + na_1x^{n-1} + \frac{n(n-1)}{1.2} a_2x^{n-2} + \dots = 0.$$

Express the symmetric function $\Sigma(x_1 - x_2)^4$ in terms of the functions

$$a_1^2 - a_0a_2, \quad a_0a_4 - 4a_1a_3 + 3a_2^2.$$

DIFFERENTIAL AND INTEGRAL CALCULUS.

MR. M. ROBERTS.

1. Show that the equation

$$(y+z) \left\{ \frac{y^2}{x} - \frac{y+z}{\sqrt{1+x^2}} \right\} dx + (y^2 + 2yz) dy - y^2 dz = 0$$

satisfies the criterion of integrability, and find its integral.

2. Adopting the usual notations of partial differential coefficients, namely,

$$p = \frac{dz}{dx}, \quad q = \frac{dz}{dy}, \quad r = \frac{d^2z}{dx^2}, \quad s = \frac{d^2z}{dx dy}, \quad t = \frac{d^2z}{dy^2},$$

integrate the equation

$$qxr + (qy - px)s - pyt = 2 \left\{ \frac{x^4}{x} - \frac{p^2x}{y} \right\}.$$

3. Integrate the equation

$$px + qy = p^2 + q^2.$$

4. Transform the partial differential equation

$$px + qy = \frac{1}{p+q}$$

into another in which the independent variables u and v are connected with x and y by the equations

$$x = u(1+v), \quad y = uv.$$

5. Find the integral of the equation

$$x^4 \frac{d^2y}{dx^2} - y = x.$$

6. Integrate the equation

$$x^2 \frac{dy}{dx} \left\{ x \frac{d^2y}{dx^2} + \frac{dy}{dx} \right\} = \phi(y).$$

7. Integrate the equation

$$\frac{dy}{dx} + x^{m-1} - \frac{m+1+x}{x} y + \frac{y^2}{x^m} = 0.$$

8. Prove that the integral of the partial differential equation

$$pqs + (rt - s^2)z = 0$$

is represented by the system

$$x = \phi(\beta) + \beta \frac{d}{d\alpha} \psi(\alpha),$$

$$y = \alpha \frac{d}{d\beta} \phi(\beta) + \psi(\alpha),$$

$$z = \alpha\beta \left\{ \frac{d}{d\beta} \cdot \phi(\beta) + \frac{d}{d\alpha} \psi(\alpha) \right\}.$$

DUHAMEL AND WALTON.

PROFESSOR JELLETT.

1. A sphere is attached to a fixed point by a fine string, and touches a uniform rod which is moveable in a vertical plane round the same point. Find the position of equilibrium.

2. To one extremity, A , of a rod which is capable of revolving freely about the other extremity, B , is attached a fine thread passing over a point situated vertically above B , and sustaining in all positions a heavy particle on a smooth curve situated in a vertical plane passing through the rod and string. Find the equation of the curve.

3. A cone rests with its base on the vertex of a paraboloid of revolution whose axis is vertical. Find the condition of stable equilibrium.

4. Show that the components of the attraction of an ellipsoid on an external point are given by the equations

$$X = -\frac{3Mf\alpha}{A^3} L,$$

$$Y = -\frac{3Mf\beta}{A^3} \cdot \frac{d \cdot \lambda L}{d\lambda},$$

$$Z = -\frac{3Mf\gamma}{A^3} \cdot \frac{d \cdot \lambda' L}{d\lambda'},$$

where

$$L = \int_0^{\frac{A}{A'}} \frac{u^2 du}{\sqrt{(1 + \lambda^2 u^2)(1 + \lambda'^2 u^2)}},$$

A being the least semiaxis of the ellipsoid, and A' the corresponding semiaxis of the confocal ellipsoid passing through the attracted point.

5. If a material point move on a fixed surface, $u = 0$, under the influence of a force whose components are X, Y, Z , show from the equations of motion that the equations of the trajectory are

$$u = 0.$$

$$\begin{aligned} & \left(\frac{du}{dx} \frac{dy}{ds} - \frac{du}{dy} \frac{dx}{ds} \right) \left(v^2 \frac{d^2x}{ds^2} - X \right) \\ & + \left(\frac{du}{dx} \frac{dz}{ds} - \frac{du}{dz} \frac{dx}{ds} \right) \left(v^2 \frac{d^2y}{ds^2} - Y \right), \\ & + \left(\frac{du}{dy} \frac{dz}{ds} - \frac{du}{dz} \frac{dy}{ds} \right) \left(v^2 \frac{d^2z}{ds^2} - Z \right) = 0; \end{aligned}$$

where v is the velocity.

a. Interpret physically the second equation.

6. Deduce the equations of the trajectory from the principle of least action, the forces X , Y , Z , satisfying the condition

$$Xdx + Ydy + Zdz = d\phi.$$

7. A particle acted on by a given central force moves in a resisting medium. Given the trajectory, determine the law of the resistance.

8. An inflexible rod whose extremities rest on fixed curves moves under the influence of given forces. Show how to investigate the value of the force tending to bend the rod at any point, and apply the method to a rod whose extremities move on two lines at right angles to each other, there being no acting force.

9. A beam which can turn freely round one extremity rests with its other extremity on a rough plane inclined to the horizon at an angle α . Determine the greatest value of α which will allow the beam to rest in any position.

10. A sphere is projected obliquely up a perfectly rough inclined plane. Find the equation of the path of the centre.

11. Determine the oscillations of an ellipsoid which floats with its least axis vertical in a fluid whose density is double that of the ellipsoid.

12. Deduce the equations of the small oscillations of a gas,

$$\gamma = -\frac{1}{a^2} \frac{d\phi}{dt},$$

$$\frac{d^2\phi}{dt^2} = a^2 \left(\frac{d^2\phi}{dx^2} + \frac{d^2\phi}{dy^2} + \frac{d^2\phi}{dz^2} \right),$$

where $d\phi = udx + vdy + wdz$.

LUNAR THEORY.

DR. SHAW.

1. Assuming the differential equation between u and θ , namely,

$$\frac{d^2u}{d\theta^2} + u = \frac{\frac{P}{h^2 u^3} - \frac{T}{h^2 u^3} \frac{du}{d\theta}}{1 + 2 \int \frac{T}{h^2 u^3} d\theta},$$

t 2

prove the differential equation for the latitude to be

$$\frac{d^2 s}{d\theta^2} + s = \frac{\frac{Ps-S}{h^2 u^3} - \frac{T}{h^2 u^3} \frac{ds}{d\theta}}{1 + 2 \int \frac{T}{h^2 u^3} d\theta}.$$

2. Prove that

$$T = -\frac{3}{2} \frac{m' u'^2}{u} \sin 2(\theta - \theta'),$$

$$Ps - S = -\frac{3}{2} \frac{m' u'^2}{u} s (1 + \cos 2(\theta - \theta')).$$

3. Prove that, to the first order of magnitude,

$$\theta' = m\theta + \beta + 2e' \sin(m\theta + \beta - \zeta);$$

and hence infer the equations,

$$\begin{aligned} \sin 2(\theta - \theta') &= \sin \{(2-2m)\theta - 2\beta\} - 2e' \sin \{(2-m)\theta - \beta - \zeta\} \\ &\quad + 2e' \sin \{(2-3m)\theta - 3\beta + \zeta\}, \\ \cos 2(\theta - \theta') &= \cos \{(2-2m)\theta - 2\beta\} - 2e' \cos \{(2-m)\theta - \beta - \zeta\} \\ &\quad + 2e' \cos \{(2-3m)\theta - 3\beta + \zeta\}. \end{aligned}$$

4. Assuming the equations,

$$\begin{aligned} \frac{T}{h^2 u^3} &= -\frac{3}{2} m^2 \left\{ \sin \{(2-2m)\theta - 2\beta\} - 2e \sin \{(2-2m-e)\theta - 2\beta + \alpha\} \right. \\ &\quad \left. + \frac{3}{2} e^2 \sin \{(2-2m-2e)\theta - 2\beta + 2\alpha\} \right\}, \end{aligned}$$

$$\begin{aligned} \frac{P}{h^2 u^3} &= \alpha \left\{ 1 - \frac{3}{4} k^2 + \frac{3}{4} k^2 \cos 2(g\theta - \gamma) - \frac{1}{2} m^2 [1 + 3 \cos \{(2-2m)\theta - 2\beta\}] \right. \\ &\quad \left. - \frac{3}{2} m^2 e' \cos (m\theta + \beta - \zeta) + \frac{3}{2} m^2 e \cos (e\theta - \alpha) \right. \\ &\quad \left. + \frac{3}{2} m^2 e \cos \{(2-2m-e)\theta - 2\beta + \alpha\} \right\}, \end{aligned}$$

and

$$\begin{aligned} 2 \left(\frac{d^2 u}{d\theta^2} + u \right) \int \frac{T}{h^2 u^3} d\theta &= \frac{3}{2} m^2 a \cos \{(2-2m)\theta - 2\beta\} \\ &\quad - 6 m^2 a e \cos \{(2-2m-e)\theta - 2\beta + \alpha\} \\ &\quad - \frac{1}{2} m^2 e^2 a \cos \{(2-2m-2e)\theta - 2\beta + 2\alpha\}, \end{aligned}$$

deduce

$$\begin{aligned} u &= 1 - \frac{3}{4} k^2 - \frac{1}{2} m^2 + e \cos (e\theta - \alpha) - \frac{k^2}{4} \cos 2(g\theta - \gamma) + m^2 \cos \\ &\quad \{(2-2m)\theta - 2\beta\} + \frac{1}{2} m^2 e \cos \{(2-2m-e)\theta - 2\beta + \alpha\} + \frac{3}{2} m^2 e' \cos \\ &\quad (m\theta + \beta - \zeta) + \frac{1}{2} m^2 e^2 \cos \{(2-2m-2e)\theta - 2\beta + 2\alpha\}, \end{aligned}$$

the integral of the first differential equation in (1).

5. From this and from the equation,

$$\begin{aligned} \left\{ 1 + 2 \int \frac{T}{h^2 u^3} d\theta \right\}^{-\frac{1}{2}} &= 1 - \frac{3}{4} m^2 \cos \{(2-2m)\theta - 2\beta\} \\ &\quad + \frac{1}{2} m^2 e \cos \{(2-2m-e)\theta - 2\beta + \alpha\}, \end{aligned}$$

deduce the true longitude in terms of the time, namely,

$$\begin{aligned}\theta = & p t + 2e \sin (opt - \alpha) + \frac{1}{2} e^2 \sin 2 (opt - \alpha) - \frac{1}{4} k^2 \sin 2 (gpt - \gamma) \\ & + \frac{1}{8} m^2 \sin \{ (2 - 2m) pt - 2\beta \} \\ & + \frac{1}{4} me \sin \{ (2 - 2m - c) pt - 2\beta + \alpha \} - 3me' \sin (mpt + \beta - \zeta).\end{aligned}$$

6. From the value of u in (4) and from the equation,

$$s = k \{ \sin (g\theta - \gamma) + \frac{3}{8} m \sin (2 - 2m - g) \theta - 2\beta + \gamma \},$$

deduce the value of $\frac{\Pi}{P}$, where P is the Moon's mean parallax, and Π her parallax at time t .

7. Suppose that whatever constants are involved in the arguments, θ , ϕ , ψ , &c., in the equation,

$$L = A + B \sin \theta + C \sin \phi + D \sin \psi + \&c.,$$

are perfectly known, and that observation gives the numerical values of a considerable number of longitudes, L_1, L_2, L_3 , &c., corresponding to the known angles, $\theta_1, \phi_1, \psi_1, \theta_2, \phi_2, \psi_2, \theta_3, \phi_3, \psi_3$; show how the constants A, B, C , &c., may be numerically determined in the two distinct cases where the observations at our disposal are and are not unlimited in number.

8. Investigate the effect of the *evection*, namely,

$$\frac{1}{4} me \sin \{ (2 - 2m - c) pt - 2\beta + \alpha \},$$

as a correction on the mean longitude, and show how this term may be represented by a change in the constants of the elliptic orbit.

9. Show that the *reduction* in the Moon's longitude is nearly the difference between her longitude in the orbit and her longitude in the ecliptic; and state the corresponding proposition respecting the *reduction* in u .

10. Assuming no disturbing force to act but the tangential, T , and the value of $\frac{T}{h^2 u^3}$ to be

$$- \frac{3}{8} m^2 \sin [(2 - 2m) \theta - 2\beta] + 3m^2 e \sin [(2 - 2m - c) \theta - 2\beta + \alpha];$$

show that the value of the radius vector would be given by

$$\begin{aligned}u = & a \left\{ 1 + e \cos (c\theta - \alpha) + \frac{1}{2} m^2 \cos [(2 - 2m) \theta - 2\beta] \right. \\ & \left. + \frac{3}{8} me \cos [(2 - 2m - c) \theta - 2\beta + \alpha] \right\}.\end{aligned}$$

11. Assuming

$$s = k \{ \sin (g) + \frac{3}{8} m \sin (2 - 2m - g),$$

$$\frac{Ps - S}{h^2 u^3} = - \frac{3m^2 a^4 s}{2u^4} \{ 1 + \cos (2 - 2m) \},$$

and

$$\frac{T}{h^2 u^3} = - \frac{3}{2} \frac{m^2 a^4}{u^4} \sin (2 - 2m);$$

deduce the value of g to the third order, namely,

$$g = \tau + \frac{3}{2} m^2 - \frac{3}{8} m^3.$$

12. Give Newton's proof that the difference of forces required to cause two bodies to revolve equally—the one in a fixed orbit, and the other in the same orbit revolving—varies inversely as the third power of the common distance from the centre of force.

MATHEMATICAL PROBLEMS.

DR. HART.

1. Find the envelope of a right line of given length, the extremities of which move along two given right lines.
2. Find the equation of the evolute of the cubical parabola $y^3 = p^2x$, and show how to determine its singular points.
3. Given the radii of the inscribed and circumscribing circle of a spherical triangle, compute the distance between their poles.
4. Find the equation of the locus of a point from which if tangents be drawn to a parabola they will have a given ratio to one another.

DR. SALMON.

5. If U , V , W represent three surfaces of the second degree—
 - (a). Find the locus of the vertices of all cones which can be represented by $\lambda U + \mu V + \nu W$.
 - (b). Find the locus of points whose polar planes with respect to the three surfaces have a common line of intersection.
6. (a). If tangent planes be drawn to a quadric through the six chords joining any four points on a plane section, prove that the twelve points of contact lie three each on one of the eight generators at the four points.
- (b). Hence deduce Sir Wm. Hamilton's theorem that the twelve umbilics lie in threes on eight imaginary right lines.
7. The normal planes to the two lines of curvature at any point on an ellipsoid intercept from the centre on the axis major portions whose rectangle is constant.
8. If ϕ denote a homogeneous function of the differences of the roots of the equation

$$a_0x^n + na_1x^{n-1} + \&c. = 0,$$

homogeneously expressed in the binomial coefficients a_0 , a_1 , a_2 , &c., prove that

$$\sum_{r=0}^{n-1} a_r \delta \frac{d\phi}{da_r} = 0,$$

where δ stands for the operator

$$a_0 \frac{d}{da_1} + 2a_1 \frac{d}{da_2} + \dots + na_{n-1} \frac{d}{da_n}.$$

MR. M. ROBERTS.

9. If y_1 , y_2 are the particular integrals of the equation

$$\frac{d^2y}{dx^2} + \frac{1}{1-x^2} \frac{dy}{dx} - y = 0,$$

prove that

$$\begin{vmatrix} 1 & y_1 & y_2 \\ 1 & y_1' & y_2' \\ 1 & y_1'' & y_2'' \end{vmatrix} = C e^{-x},$$

the accents denoting successive differentiations with respect to the independent variable.

10. Integrate the partial differential equation of the first order,

$$f(p) \phi(x) + f_1(q) \psi(y) = F(p) + F_1(q).$$

11. Find the centre of gravity of a lamina whose form is that of an elliptic quadrant, the density at any point varying inversely as the difference of the squares of the semiaxes of the ellipse and hyperbola passing through the point and confocal with the elliptic circumference.

12. Dr. Boole presents the integral of the partial differential equation

$$z \sqrt{1 + p^2 + q^2} = 1$$

under the form

$$\begin{cases} \sqrt{1 - z^2} = cx + \sqrt{1 - c^2} y + \phi(c) \\ 0 = \frac{d}{dc} \left\{ cx + \sqrt{1 - c^2} y + \phi(c) \right\}. \end{cases}$$

Show from geometrical considerations the identity of this solution with the solution ordinarily given, namely,

$$\begin{cases} (x-a)^2 + (y-\psi(a))^2 + z^2 = 1, \\ (x-a) + (y-\psi(a)) \psi'(a) = 0. \end{cases}$$

PHYSICAL PROBLEMS.

PROFESSOR JELLETT.

1. A heavy beam rests with its extremities on two rough cylinders whose axes are at right angles to the beam, and which rest on a rough horizontal plane. If the cylinders be slowly drawn away from each other till equilibrium is broken, determine the nature of the initial motion.

2. The extremities of a heavy rod are attached by cords of equal length to a horizontal beam. If one of the cords be cut, find the initial tension on the other, and determine the angle at which these cords should intersect the beam in order that the tension may be a maximum.

3. In the motion of a point on a surface, if the osculating plane to the trajectory pass through the direction of the acting force, the trajectory is either that which would be described freely, or a geodetic line?

4. A heavy particle is attached by an elastic string to one extremity of a rod whose weight is the same as that of the particle, the attachment being so arranged, that when the string has its natural length the particle shall be situated at that extremity. If, the rod being laid on a smooth horizontal plane, the particle be drawn to the other extremity and let go, find the motion.

5. If the ordinary expression for the velocity of a liquid issuing from a small orifice, namely,

$$v = \sqrt{2gh},$$

were true *at* the orifice, show that the pressure at the opposite point would be greater than the statical pressure, and determine the ratio.

a. Given that the pressure is equal to the statical pressure, find the area of the *vena contracta*.

Moderatorships in Classics.

Examiners.

CHARLES GRAVES, D. D.

THOMAS STACK, M. A., Regius Professor of Greek.

JOHN K. INGRAM, LL. D., Professor of English Literature.

THOMAS K. ABBOTT, M. A.

DR. INGRAM.

Translate the following passages into English :—

1. *Beginning*, οἱ δ' ἐς βῆσαν ἵκανον ἱπακτῆρες· πρὸ δ' ἄρ' αὐτῶν, κ. τ. λ.
Ending, λικριφίς ἀίξας, οὐδ' ὀστέον ἵκετο φωτός.
HOMER, *Odyssey*, xix. 435-51.
2. *Beginning*, Μοῖσα, καὶ παρ Δεινομένει κελαδῆσαι, κ. τ. λ.
Ending, Ἑλλάδ' ἐξέλκων βαρείας δουλίας.
PINDAR, *Pythia*, i. 58-75.
3. *Beginning*, ὄρα, ὄρα μάλ' αὖ, κ. τ. λ.
Ending, δελτογράφῳ δὲ πάντ' ἐπωπᾷ φρενί.
ÆSCHYLUS, *Eumen.*, 255-275.
4. *Beginning*, ὦ χθονία βροτοῖσι φάμα, κ. τ. λ.
Ending, σοφά τ' ἀρίστα τε παῖς κειληῖσθαι.
SOPHOCLES, *Electra*, 1066-1089.
5. *Beginning*, ἃ δ' ἐν δόμοις ἔδρασε θαυμάσει κλύων, κ. τ. λ.
Ending, κακὸν μεθίστη χρωτὸς εὐειδῇ φύσιν.
EURIPIDES, *Alcestis*, 151-174.
6. *Beginning*, Αἰ. σὺ δ', ὦ θεοῖσιν ἐχθρὲ, ποῖά γ' ἐστὶν, ἄττ' ἐποίεις;
κ. τ. λ.
Ending, Αἰ. φημί κῆγω.
ARISTOPHANES, *Ranæ*, 967-985.

MR. STACK.

Translate the following passages into English :—

1. *Beginning*, Πείθωμεν τοίνυν αὐτὸν πρῶως, κ. τ. λ.
Ending, Καὶ ὁρθῶς γ' ἔφη.
PLATO, *De Republ.*, ix. 12.
2. *Beginning*, Τέλος δὲ ὁ Περίανδρος κήρυγμα ἐποιήσατο, κ. τ. λ.
Ending, ἔστ' ἂν πυνθάνηται περιέοντα τὸν πατέρα.
HERODOTUS, lib. iii. c. 52, 53.
3. *Beginning*, Καὶ εἴ τῃ ἄρα παρέστηκε, κ. τ. λ.
Ending, οὐ γὰρ ἔργῳ ἴσον, ὥσπερ τῷ δικαιώματι, ἐστίν.
THUCYDIDES, lib. vi. c. 78-80.
4. *Beginning*, Δοιπὸν δ' ἐστὶν ἡμῖν περὶ τε τῆς νομιζομένης, κ. τ. λ.
Ending, καὶ ὅτι οὐ πόρρω αὐταὶ ἀλλήλων, φανερόν.
ARISTOTLE, *Politie*, lib. iv. c. 6.

DR. GRAVES.

Translate the following passages into English :—

1. *Beginning*, Pallada nunc pueri, teneræque ornate puellæ.....
Ending, Quique facis docta mollia saxa manu.
OVID, *Fasti*, lib. iii. 818-832.
2. *Beginning*, Omnia Romanæ cedent miraculæ terræ.....
Ending, Spes et venturæ conjugis aptus amor.
PROPERTIUS, lib. iii. *Eleg.* xli. 17-42.
3. *Beginning*, Quadringenta tibi si quis Deus aut similis Dis.....
Ending, Ante illum uxoris, post quem nil amplius edit.
JUVENAL, *Sat.* v. 132-148.
4. *Beginning*, Scis etenim justum gemina suspendere lance.....
Ending, Sed præcedenti spectatur mantica tergo.
PERSIUS, *Sat.* iv. 10-24.
5. *Beginning*, P. Nequeo te exorare, ut maneat triduum hoc?.....
Ending, A. Mihin' domi'st? immo, quod aiunt, Auribus teneo lupum.
TERENCE, *Phormio*, act. III. sc. ii. 4-21.
6. *Beginning*, Denique, ubi in medio nobis equus acer obhæsit.....
Ending, Navigia, aplustris fractis, obnitier undis.
LUCRETIVS, *De rerum Nat.*, lib. iv. 422-439.

MR. ABBOTT.

Translate the following passages into English Prose :—

1. *Beginning*, Cetera item funebria, quibus luctus augetur,.....
Ending, aliud habitum esse sepelire, et urere.
CICERO, *De Leg.*, lib. ii. c. 24.

2. *Beginning*, Mandatum tuum curabo diligenter :.....
Ending, ut, quamprimum te videre possimus. Vale.
 CICERO, *Epist. Famil.*, lib. vii. *Epist.* 2.
3. *Beginning*, Forte illis diebus Cæsar inspecto ornatu,.....
Ending, quod insitus et adoptivus per injurias matris exerceret.
 TACITUS, *Annal.* lib. xiii. c. 13.
4. *Beginning*, Negatis quemquam præstare quæ loquitur,.....
Ending, suos spectatores conspuerent.
 SENECA, *De Vita Beata*, c. 19.
5. *Beginning*, Et ulmus detruncata media in ramorum.....
Ending, arberem aut circa proxumam calibem.
 PLINY, *Hist. Nat.*, lib. xvii. c. 23.

MR. STACK.

Translate the following passage into Greek Prose :—

Beginning, Igitur Thrasullus rîsdem rupibus inductus,.....
Ending, et antiqua ætas et nostro tulerit.

TACITUS, *Annal.* vi. 21, 22.

DR. INGRAM.

Translate the following passage into Greek Trimeter Iambics :—

Beginning, *Pan.* Discover, noble queen, to us thy handmaidens,.....
Ending, *Hel.*.... Disperses back to their abysses, or subdues.

CARLYLE from GÖTHE.

MR. ABBOTT.

Translate the following passage into Latin Prose :—

Beginning, To speak now of the true temper of empire :.....
Ending, and yet not to endure the means.

BACON, *Essays—of Empire.*

DR. GRAVES.

Translate the following passages into Latin Verse :—

1. *Beginning*, Fired at the sound, my genius spreads her wing,.....
Ending, And learns to venerate himself as man.
 GOLDSMITH, *Traveller.*
2. *Beginning*, Vain, very vain, my weary search to find.....
Ending, Leave reason, faith, and conscience, all our own.
 Ibid.

PROFESSOR STACK.

The Candidates are required to discuss the following Questions :—

1. Compare Greek and Roman literature as to their bearing on modern sympathies.
2. Compare Greek and Roman poetry as to the degree and manner in which they were affected by political events, and by religion.
3. Write a note on the *Italian* influences visible in Roman literature.
4. Compare the influence exercised by the early Tragic and Comic Drama among the Romans, and account for the greater permanence of one of these forms of composition.
5. Write a note on the influence of the *mercantile* party among the statesmen of the later Roman Republic ; and point out some of the important political proceedings and events which appear to be due to their influence.
6. Comment on the statement that, during the last century of the Republic, the Romans had the evils of party life without its countervailing benefits.
7. Write a general comparison of the characteristics, political and literary, of the Roman State in the sixth and the seventh centuries of the Republic.

MR. ABBOTT.

1. Mention the principal branches of the Aryan family of languages, classifying them according to the antiquity of their forms.
2. Describe the nature of the evidence by which the affinity of these languages is proved.
3. Is there any reason to suppose the existence of a primitive Italo-Hellenic tongue after the separation of the Northern European branch ?
4. Make out a scheme of the original personal terminations of the Aryan verb, primary and secondary.
5. How was the imperfect formed in Latin and in Greek respectively ? How did it happen that a new form originated in Latin ?
6. How is the formation of tenses by composition proved ?
7. On what Greek form does Bopp base his theory of the origin of the middle suffixes ?
8. This theory does not account for the plural forms ?
9. What is meant by the weight of the personal endings ? Give instances of its effect.
10. Enumerate all the comparative and superlative suffixes of which traces exist in Greek, Latin, or English, and account for the usual forms in these languages.
11. What are the Latin affinities of $\delta\epsilon$ relative and $\delta\epsilon$ possessive, respectively ? Show by examples that the changes supposed in the Greek words were required by the phonetic laws of that language.

12. State the ordinary rule as given by Kühner (Jelf), &c., for the use of the indicative with *εἰ* in the protasis followed by the optative with *ἄν* in the apodosis.

13. State also the rule given for the use of the historic tenses of the indicative with *εἰ*, the consequent being also in the indicative with *ἄν*.

14. Among the examples of these two rules cited by Kühner are the following:—

Of the first—*a. οὐδ' ἄν ἐγὼ πεφιδόμην οὔτε σεῦ οὔθ' ἐτάρων, εἰ μὴ θυμός με κελεύει.—Od. ι. β. ἡ γὰρ κεν δειλός τε καὶ οὔτιδανός καλεοίμην, εἰ δὴ σοι πᾶν ἔργον ὑπείξομαι ὅττι κεν εἴπῃς.—Il. α. γ. πολλὴ γὰρ ἄν τις εὐδαιμονία εἴη περὶ τοὺς νέους, εἰ εἰς μὲν μόνος αὐτοὺς διαφθεῖρει, οἱ δ' ἄλλοι ὠφελοῦσιν.—Plat. Apol.*

Of the second—*a. καὶ νῦν κεν Ἀκτοριῶνε Μολιόνε παῖδ' ἀλάπαξα, εἰ μὴ σφῶι πατὴρ ἐκ πολέμου ἐσάωσε.—Il. λ. β. οὐκ ἄν οὖν νήσων ἐκράτει εἰ μὴ τι καὶ ναυτικὸν εἶχεν.—Thucyd.*

If possible, apply the principles stated to these instances; if not, give a more correct explanation of the constructions.

15. It is an error to found principles of this kind in whole or in part on Homeric usage?

16. What tenses in Latin have an aoristic sense in the indicative and subjunctive respectively?

17. State fully the laws followed by the tenses and moods in questions and commands put in the Oratio Obliqua in Latin. Change the following examples accordingly into the oblique construction:—"Si ignoscere volo num oblivisci possum? Si perseveras, hujus reminiscitor, nec commiseris, ut—"

The Candidates were further examined vivâ voce in the Political and Literary Histories of Greece and Rome.

Moderatorships in Experimental and Natural Science.

Examiners.

THOMAS LUBY, D. D.

JAMES APJOHN, M. D., Professor of Chemistry.

JOSEPH A. GALBRAITH, M. A., Professor of Experimental Philosophy.

SAMUEL HAUGHTON, M. D., Professor of Geology.

WILLIAM H. HARVEY, M. D., Professor of Botany.

EDWARD P. WRIGHT, M. D., Lecturer in Zoology.

DR. LUBY.

1. In the case of the rainbow determine the direction of the emergent pencil after *p* reflections. The problem to which this is reduced may be solved by a simple construction?

2. In Young's experiment in the case of interference of light, if λ be the length of a wave, the place of the n^{th} band is expressed by the formula

$$x = \frac{n\delta\lambda}{2c};$$

prove this, stating on what condition it depends, and how to distinguish a dark band from a bright one.

3. Explain Fresnel's experiment for the same purpose, and show what advantages it has over that of Young.

4. In this experiment the place of a band is expressed by the formula

$$x = \frac{(a + \delta)n\lambda}{2a \cdot \sin \epsilon};$$

prove this, explaining the terms.

5. In the case of double refraction by crystals, explain what is meant by the *extraordinary index*.

6. Give accurately Huyghens' construction for the direction of the refracted rays in the case of double refraction.

7. Show how Huyghens was led to the discovery of polarized light, and to what extent.

8. State the two characters that peculiarly distinguish a polarized ray.

9. The physical nature of common or unpolarized light may be inferred from that of polarized light by a law discovered by Malus; state this law, and show how. Dove's experiment would suggest a different origin for common light.

10. State the principles of Fresnel as modified by Neumann and M'Cullagh for applying the theory of transversal vibrations to the problem of reflection and refraction at the surfaces of crystallized media.

11. Prove that when light is polarized in the plane of incidence the amplitudes of the reflected and refracted vibrations are expressed by the formulæ

$$v = \frac{\sin(\theta - \theta')}{\sin(\theta + \theta')} \text{ and } v' = \frac{\sin 2\theta}{\sin(\theta + \theta')},$$

where θ and θ' are the angles of incidence and refraction.

12. State the two principles on which the problem can be solved when the ray is polarized perpendicularly to the plane of incidence.

13. In the case of elliptic polarization determine the equation of the ellipse from the two fundamental equations

$$x = a \cdot \sin(vt - \alpha) \quad y = b \cdot \sin(vt - \beta).$$

14. Determine the position and ratio of the axes of this ellipse.

PROFESSOR GALBRAITH.

HEAT.

1. Deduce from Regnault's experiments the following expression for

the weight of a gas or vapour in terms of its volume, pressure, density, and temperature,

$$W(\text{grammes}) = 0.4646 \frac{V(\text{litres}) \times p(\text{millimetres}) \times \text{density}}{273 + t^\circ(\text{C})}.$$

Weight of a litre of dry air at 0°C . and 760 mm. = 1.293187

Coefficient of expansion for 1°C . „ = 0.00366

2. From this deduce by comparison of English and metrical measures a corresponding formula for the weight in grains in terms of the volume in cubic inches, the pressure in inches, and the temperature in Fahrenheit degrees.

3. If 50 litres of carbonic acid gas at 100°C . and 780 mm. be mixed with 10 litres of hydrogen at 10°C . and 750 mm., what will be the density of the mixture?

Density of carbonic acid = 1.529

Density of hydrogen = 0.0693

4. If this mixture be contained in a vessel of 50 litres, capacity, and maintained at a temperature of 60°C ., what will be its elastic force?

5. By what experiments and reasoning did Dulong and Petit establish the equation—

$$v = ma^\theta (a^t - 1),$$

in which v is the velocity of cooling in vacuo, θ the temperature of the envelope, t the excess of that of the hot body, $a = 1.0077$, and m a constant depending on the nature of the surface.

6. Proceeding from the equation in the last question, prove that

$$x = \frac{1}{ma^\theta \log a} \log \frac{a^s - 1}{a^t - 1} \times \frac{a^t}{a^s - 1},$$

in which equation x is the time of cooling, s the original excess of temperature, and t the excess corresponding to the time x .

7. Helmholtz has computed from Bischof's experiments on basalt that it would take 350 millions of years to cool our earth from an excess of 2000°C . to an excess of 200°C . over the temperature of equilibrium with surrounding space; assuming this, and also that the equilibrium temperature is 10°C ., compute by means of the equation in the last question the time it would take the earth to cool down from 50°C . to 25°C ., a range of temperature which corresponds to the interval between the earliest possible limit of organic life and the deposition of the London tertiary clays.

8. Let W be the weight of a liquid whose latent heat is λ , and specific heat is c ; let W' be the weight of the vessel which contains it, and c' its specific heat, let also T° be the melting point of the liquid when it changes state; calculate in terms of these quantities the temperature to which the liquid should be lowered below T° in order that when agitated the whole should suddenly congeal into a solid mass at T° .

9. Adapt to English measures the theoretical formula for the velocity of sound in a gaseous medium, viz.:—

$$v = \sqrt{k \times \frac{\text{elasticity}}{\text{density}}};$$

show that

$$v = 41.36 \sqrt{k \times \frac{(460 + t)}{s}},$$

in which v is the velocity in feet per second, t the temperature of the gas, s its specific gravity, and k the ratio of its specific heats under constant pressure and constant volume.

10. Calculate the velocity of sound in an atmosphere of carbonic acid, at a temperature of 50° , $k = 1.338$ $s = 1.529$.

ELECTRICITY AND MAGNETISM.

1. What is the law of the action of an element of an electric current on a magnetic pole? Deduce from this law the expression for the whole force with which a finite portion of a straight current, considered as a base, acts on the pole considered as a vertex; and show that it is proportional to the sum of the cosines of the base angles directly, and to the altitude inversely.

2. Describe the action of a magnetic bar on a floating circular current, the bar being placed in the axis of the current. How does the force with which one of the poles acts on the current vary? What will be the nature of the motion of the current both outside and between the poles? What will be the position of stable and of unstable equilibrium?

3. State the principles on which Ampère's formula for the force with which two current-elements act on each other, namely,

$$F = \frac{ii' ds ds'}{r^2} (\sin \theta \sin \theta' \cos \epsilon + k \cos \theta \cos \theta'),$$

is founded; and if the value of k be assumed to be equal $-\frac{1}{2}$, prove that

$$F = \frac{ii' ds ds'}{r^2} (\cos \omega - \frac{1}{2} \cos \theta \cos \theta'),$$

ω being the angle between ds and ds' .

4. By means of this formula, investigate the action of one side of a right-angled triangle along which a current runs upon an element of a current running in a parallel direction, and having its middle point situated at the opposite angle.

5. On what does the sensibility of a galvanometer depend when used to measure the intensities of hydro-electric currents and thermo-electric currents?

6. When will the intensity of a system consisting of b rows of a cells be the same as a rows of b cells?

7. Let there be 72 cells of equal dimensions, and let the interpolar resistance be equal to half a cell-resistance; ascertain the best and worst arrangements, and compare the intensities in each case.

8. State and prove the expressions for the intensities of the principal, partial, and derived currents corresponding to a given primitive current.

9. Let R be the total resistance between two telegraph stations; let

x be the resistance from the first station to a point on the line where by accident or otherwise a communication is established with the earth whose resistance is ρ . Prove that the intensity of the impaired current received at the second station is to its original value, before the connexion with the earth is made, in the ratio of

$$1 : 1 + \frac{(R-x)x}{R\rho}.$$

10. Where should the connexion be made so as to produce the most enfeebling effect on the current at the receiving station?

11. Describe Regnault's method of investigating experimentally the value of the electromotive force in different combinations.

12. Pouillet has proved that the current which is able to decompose one gramme of water in a minute is 13787 times stronger than that furnished by the standard thermo-electric couple when it encounters a resistance of 20 metres of copper wire of 1 millimètre diameter. If now we assume that the true electromotive force of a couple is measured by the weight of hydrogen it is able to decompose in one minute in a voltmeter when the circuit has a unit of resistance, viz., that of a cylinder of mercury one mètre in length and one millimètre diameter; find the true value of the electromotive force of the standard couple, supposing the conducting power of copper to be 50 times that of mercury.

EARTHQUAKES AND VOLCANOES.

PROFESSOR HAUGHTON.

1. If a wall, whose height is a , and width b , be overthrown by the shock of an earthquake; prove that the horizontal velocity of the shock, perpendicular to the wall, is

$$v^2 = \frac{4}{3}g \left(\frac{a^2 + b^2}{a^2} \right) \sqrt{(a^2 + b^2) - a}.$$

2. Prove that the horizontal velocity, perpendicular to such a wall, necessary to break it across at the base, is

$$v = \frac{2}{3}g \frac{Lb}{a^2};$$

where L denotes the length of wall, whose weight would be sufficient to tear it asunder.

3. In the Naples earthquake, a wall was thrown down at Barielle, whose height was 26 ft., and width 4 ft. Calculate the horizontal velocity of the shock, perpendicular to this wall, assuming $L = 13$, one-fourth the coefficient for the best rubble masonry.

4. The path of the earthwave at Barielle was not perpendicular to the wall, but its angle of incidence on the wall was 25° , and its angle of emergence from the ground was 15° ; find its actual velocity from these data.

5. At Vietri di Potenza, a large stone forming one face of the water conduit, 6 ft. by 3 ft. by 1 ft., was *not* upset, the earthwave passing in a

plane parallel to the face (6×3); if we assume one foot additional in the height of the block, due to the superimposed capping of the monument, and 13 ft. per second as the actual velocity of the shock, it is required to determine a major limit to the angle of emergence of the earthwave.

6. At Villa Carusso, some roof tiles were projected to a horizontal distance of 9 ft., having fallen from a height of 33 ft.; it is required to find the angle of emergence of the shock, assuming the actual velocity of the earthwave to be 13 ft. per second.

7. At the Palazzo Romani, Mr. Mallet found the angle of emergence to have been $25^{\circ} 30'$, and observed that a vase in the garden had been thrown from its pedestal, horizontally $6\frac{1}{2}$ ft., and vertically 3.6 ft.; it is required to find the actual velocity of shock that produced this projection of the vase.

8. State Mr. Scrope's theory of the relation between axes of elevation and axes of volcanic action; illustrate this theory by examples in detail, and show that it is founded on sound mechanical principles.

9. If a vertical columnar pillar of basalt, trachyte, or other rock, be drawn asunder lengthwise by a force P ; show that it will be most easily fractured along a plane whose angle of inclination with the horizon is given by the equation

$$2i = \phi + 90^{\circ};$$

where i denotes the inclination of the plane, and ϕ the angle of friction of the rock composing the pillar.

10. Hence show, on mathematical principles, that if such a pillar be cooling from a liquid condition, and be more viscous on the outside than in the interior, its easiest surface of separation will be cupshaped, or convex downwards.

DR. APJOHN.

CHEMISTRY, MINERALOGY, AND CRYSTALLOGRAPHY.

1. Describe and explain the chlorometric processes recommended by Graham, by Gay-Lussac, and by Bunsen.

2. Explain the reactions which take place between iodine and ammonia in the production of the well-known detonating compound.

3. Describe the different processes which may be successfully employed for analyzing a mixture of alumina, sesquioxide of iron, and sesquioxide of chrome.

4. How would you make the analysis of a compound including lime, magnesia, alumina, and peroxide of iron?

5. How would you prepare Sonnenschein's test, and by means of it determine the amount of phosphoric acid in a given specimen of bone earth?

6. Enumerate the metals whose recently precipitated sulphides are soluble in sulphide of ammonium, and explain how you would make the analysis of an alloy composed of the three metals in this group which are most prone to oxidation.

7. Write the formulæ of hyacinth and garnet; state the crystalline systems in which they occur, and explain how, by polarized light, cut

specimens of these minerals, such as are used in jewellery, may be distinguished from each other.

8. Specimens of Vesuvian have yielded upon analysis results corresponding to the empirical formula $9\text{RO} + 2\text{R}_2\text{O}_3 + 55\text{SiO}_3$. How is this to be reconciled with the doctrine that Vesuvian is a dimorphous garnet?

9. Enumerate, name, and specify the crystalline systems of the different compounds of nickel and of cobalt with arsenic, and with sulphur and arsenic.

16. The minerals known under the names of antimonial nickel, and nickel stibine, are materially different. How are they distinguished from each other?

11. A Scotch mineral analyzed by Rammelsberg, was found to have the following composition :—

Silex, ...	38.09
Alumina, ...	31.62
Lime, ...	12.60
Soda, ...	4.62
Water, ...	13.40

How was the analysis made, and what formula does it yield?

12. Write a list of the anhydrous oxides occurring in the mineral kingdom, grouping them according as they occur in the 1st, 2nd, 3rd, or 4th systems, and writing the formula of each.

13. Write a similar list of the hydrated oxides.

14. A Cornish mineral in hemihedral crystals of the first system was analyzed with the following results :—

Arsenic acid, ...	40.37
Protoxide of iron, . .	12.63
Peroxide of iron, . .	28.08
Water, ...	1.95

How was the analysis made, and what is the empirical formula to which it conducts? State also what you consider the most probable rational formula of the mineral.

15. Give Rose's notation of a face of the ikositetrahedron, and explain how it may be derived from the cube, the octahedron, the rhombic dodecahedron, and the tetrakis hexahedron.

16. In a compound form of quartz given by Dana, a face is marked $\frac{1}{2}$. What is the position of such a plane in the notation of Rose?

17. What is the group of isomorphous crystals in which Kopp has pointed out a remarkable relation between the length of the optic axis and the atomic volume? State also what the relation is.

18. How is the genesis of the diploid best conceived, and what is the notation, according to Rose, of one of its faces?

19. Write a list of positive, and a list of negative uniaxal crystals, and explain the optical character by which they are distinguished.

20. In the mineral called meionite there are planes which Dana marks $\bar{1}3$, $\bar{1}\bar{3}$, 33 ; in lievrite there are planes he marks $\bar{2}$, $\bar{2}$, and $2\bar{1}$; in orthoclase there are planes $2\bar{1}$ and $\bar{1}3$. Give the notation by which Rose fixes the position of these several planes.

ORGANIC CHEMISTRY.

1. 22.96 grains of the silver salt of an organic acid destitute of nitrogen, when burned with oxide of copper, gave—

Carbonic acid, ...	10.874 grains.
Water, ...	2.436 do.

Also, upon igniting 50.178 grains of same salt in a porcelain crucible, a residue of metallic silver was obtained which weighed 29.894 grains of metallic silver. From these data deduce the formula of the acid, assuming it to be bibasic.

2. 8.568 grains of a liquid destitute of nitrogen, burned with oxide of copper, yielded—

Carbonic acid, ...	21.066
Water, ...	10.558

A flask, too, whose capacity at 60° was 18.015 cubic inches, when filled with dry air at temperature of 60° and pressure of 30.21, weighed 1135.074 grains; and, when filled (with the exception of a bubble of air of bulk = 0.405 of an inch) with the vapour of the liquid under consideration, weighed 1141.314 grains; the temperature of the flask being 303° , and the pressure still 30.21. From these results calculate the composition of the liquid, the specific gravity of its vapour, and its atomic weight, on the hypothesis of its atomic volume being 4.

3. There are two liquids, each including chlorine, which, when acted on by more chlorine, give two series of metameric compounds. Give the formula of each liquid, and state the particulars in which the corresponding terms of the two series agree, and in which they differ.

4. Give the composition of glycerine viewed as a triatomic alcohol, and explain how it may be artificially made.

5. Write the formula which represents a fat, and explain the changes it undergoes during saponification.

6. Describe the preparation of ethylamine by the process of Würtz, and also by the more simple method of Hofman.

7. Give the formulæ of the volatile oils of garlic and mustard, and explain how each may be artificially made.

8. How from iodide of allyl would you prepare allyl and allylic alcohol?

9. There is a compound which is generally considered as a variety of urea, in which the hydrogen is partially replaced by allyl, and the oxygen completely replaced by sulphur. How is it made?

10. Give the composition of indigo insoluble in water, and of that which dissolves; mention the properties by which they are distinguished; and explain the ordinary process by green vitriol and lime for converting the insoluble into the soluble variety.

11. Write the formula of aniline, and explain how it is procured from isatine, from carbolic acid, and from nitro-benzole.

12. Write the composition of carbazotic acid, viewing it as a substitution compound derived from carbolic acid, and mention the chief material from which it is made, together with its leading properties and applications.

13. How did Dr. Maxwell Simpson effect the synthetic production of succinic acid, and what constitutes the theoretic interest of this important discovery?

14. What is the general process by which Gerhardt obtained the anhydrides of several of the monobasic acids, having for formula



15. Write a list of the ketones belonging to the formic, acetic, propionic, butyric, valerianic, and benzoic acids; and describe the general process by which they are obtained.

16. Give the general expression for the aldehyds of the monatomic alcohols; enumerate the chemical characters by which they are distinguished; and mention the term of the same heterologous series with which each aldehyd is polymeric.

17. What, according to Kopp, is the law which regulates the boiling points of certain compounds constituting a homologous series?

18. A syrup, including of diabetic or grape sugar as much as would produce a rotation of 12° , gave in the saccharimeter of Soleil a rotation to the right of 63° , and when inverted a rotation to the right of 8° . How much cane sugar, diabetic sugar, and fructose would one gallon of the syrup include?

DR. WRIGHT.

PHYSIOLOGY.

1. Show the importance of saliva in promoting digestion.
2. Why is the stomach not destroyed by the action of the gastric juice?
3. Prove from comparative anatomy that the lacteals do not absorb the larger quantity of the chyle.
4. Describe the principal organic constituents of human blood.
5. Describe the circulation of the blood in any of the Crocodiles.
6. Describe the circulation of the blood in the Cephalopoda, and in the Lamellibranchiata.
7. Describe the circulation of the blood in the Brachiopoda and Tunicata.
8. How is respiration effected in Man, in Birds, and in the Lacertine and Chelonian Reptiles?
9. What three cardinal characteristics distinguish organic from inorganic beings?
10. Contrast the function of nutrition with that of reproduction.

ZOOLOGY.

1. Give the leading characteristics of the five sub-kingdoms.
2. How may the Infusoria be distinguished from other Protozoa?
3. What number of primitive types, according to Carpenter, may be reasonably supposed to have given origin by the ordinary course of "descent with modification" to the vast multitude of forms among the Foraminifera?
4. Describe the aquiferous system in Sponges.
5. What forms of reproduction are met with among the Protozoa?
6. Contrast the two sub-kingdoms Protozoa and Coelentera.
7. Compare the classes Hydrozoa and Actinozoa.
8. Describe the structure of a typical Corallite.
9. Define the order Rugosa. Where does Agassiz propose to place it?
10. Refer the precious Coral of commerce to its proper order and family.
11. Compare the nutrient system in Actinia and Beroë.
12. How has Mr. Darwin explained the true nature of Barrier Reefs and Atolls?
13. Give some account of the distribution, bathymetrical and geographical, of the reef-building Corals.
14. Describe the ambulacral vascular system in Echinodermata.
15. Describe the corona of an Echinus.
16. What are the chief characteristics of Echinoida, Clypeastroida, and Spatangoida?
17. Name some extinct genera of Echinoderms in which the antambulacral region predominates; also some in which the two regions are nearly equal.
18. Give an outline of the digestive system in Holothuridea, Echinoidea, Crinoidea, Asteridea, and Ophiuridea.
19. What families of Echinoderms possess an oral skeleton?
20. Describe the metamorphosis of the common fly and of the common grasshopper.
21. Refer the following genera to their respective orders:—Stylops, Pulex, Pediculus, Podurus, Termes, Forficula.
22. Give the chief orders of the class Crustacea, marking those which are extinct.
23. Give an account of the reproduction of the Salpidæ.
24. Contrast a Cardium (both the animal and shell) with a Terebratula.
25. Contrast the vertebræ of Lepidosteus with those of Gadus.
26. Give a brief description of the "chorda dorsalis" as it occurs in the different orders of fish.
27. Give the geographical distribution of the different species of Crocodiles.

28. Give an account of the various modifications of horns which are met with among the Ruminantia.

29. Give the dentition of the common hare.

30. Refer the following to their native countries:—chimpanzee, giraffe, reindeer, turkey, common fowl, peacock, emeu, rattlesnake, boa, axolotl, tunny, lepidosteus.

31. Refer the following to their respective orders and families:—ant-eater, ayeaye, canary, cinchilla, dodo, flamingo, flying fox, giraffe, horn-bill, lyre bird, mole, paradise bird, porpoise, swift, walrus.

BOTANY.

DR. HARVEY.

1. In what cryptogamic plants have stomates been observed?
2. Describe the evolution and name the varieties of vascular tissue.
3. Of what do the fibro-vascular bundles in a Fern consist?
4. Describe the cortical system of an Exogen.
5. What structural difference is observable in the epidermal cells of leathery or succulent leaves, as contrasted with those of soft or thin leaves?
6. By what contrivances are the interior tissues of plants brought into contact with air? and what varieties of the "aërial system" commonly occur?
7. What is the structure of a sting (as of a *nettle*), and how does it act?
8. What is the structure and what the function of *laticiferous* tissue, and in what plants is it most readily observed?
9. Contrast the fibro-vascular system of the stem of a Tree-fern with that of a Palm-tree.
10. State the origin, structure, mode of development, and use of the medullary rays.
11. Define the terms *palmifid*, *palmisect*, *palmipartite*, *palmate*, *pedatifid*, *pedatisect*, *pedate*, as applied to leaves.
12. Define the terms *hastate*, *sagittate*, *cordate*, *reniform*, *panduriform*, *auricled*, *connate*, *perfoliate*, *oblique*, as applied to leaves.
13. Describe the leaf of *Dionæa muscipula*.
14. How are the pitchers of *Sarracenia* formed?
15. What British plants have *circinate* veneration of leaf?
16. Give examples of simple and compound *scapes*.
17. Describe the inflorescence of a Fig, and contrast it with that of a Mulberry.
18. Give examples of herbaceous and coloured perianths.
19. Give examples of valvate sepals and petals.
20. Describe the principal modes of dehiscence of anthers.
21. Define the terms *raphe*, *chalaza*, *micropyle*, *primine*, and *secundine*, as applied to ovule or seed.

22. Give examples of seeds with horny, floury, and oily albumen, and of exalbuminous seeds.

23. Give examples of plants having excentric embryos.

24. Name, in the order of their importance, the structural characters which assist in the determination of the natural affinities of plants.

SYSTEMATIC BOTANY.—(*Bentham's British Flora.*)

25. What exceptional characters occur in the *calyx* among the British genera of *Ranunculaceæ*?

26. What is the chief distinction between *Papavaraceæ* and *Ranunculaceæ*? and how do the former differ from *Fumariaceæ*?

27. On what special characters are the genera of *Cruciferae* chiefly based?

28. How is *Cerastium* known from *Stellaria*?

29. What are the floral and carpological characters of *Linum*?

30. How are the stamens inserted in *Rhamnaceæ*?

31. In what group of *Leguminosæ* are the stamens often indefinite?

32. Distinguish the suborders of *Rosaceæ*, giving examples of each.

33. How is *Potentilla* distinguished from *Fragaria*?

34. What relation do the stamens bear to the petals in such British *Onagraceæ* as have petals?

35. Which of the British species of *Saxifraga* are peculiar to the west of Ireland?

36. How is *Araliaceæ* best known from *Umbelliferae*?

37. State how the parasitism of the *Mistletoe* differs from that of the *Dodder*?

38. Describe the floral envelopes in *Dipsaceæ*.

39. Of what organ is the pappus in *Compositæ* a modification?

40. In which of the *Compositæ* are the ligulate flowers complete?

41. How do *Erica*, *Arbutus*, and *Vaccinium* differ; and in what do they agree?

42. Distinguish *Solanaceæ* from *Boragineæ*.

43. What are the British genera of *Amentaceæ*?

44. Describe the structure of a pine cone.

45. Describe the arrangement of the floral organs in *Orchideæ*.

46. How does *Crocus* differ from *Colchicum*?

47. Describe the female flower of *Carex*.

48. What are the chief modifications of the flower in British grasses?

49. Enumerate the genera of British Ferns which have an indusium, and those that have none.

Moderatorships in History, Political Science, and English Literature.

Examiners.

JOHN TOLEKEN, M. D.

MOUNTIFORD LONGFIELD, LL. D., Professor of Feudal and English Law.

GEORGE M'DOWELL, M. A.

JOHN K. INGRAM, LL. D., Professor of English Literature.

JAMES W. BARLOW, M. A., Professor of English History.

HISTORY.

PROFESSOR BARLOW.

1. Who was the author of the "Dialogus de Scaccario," and when was it written? What important inference as to the condition of the Saxons in England under William I. does Hallam deduce from this treatise?
 2. Compare the English Revolution of 1399 with that of 1688 with respect to the attention shown by the principal actors to the formalities of the Constitution.
 3. Write a short account of the Irish Rebellion of 1534.
 4. How does Hallam account for the secret connexions formed by Lord Hollis, Lord Russell, and Algernon Sidney, with Louis XIV., through his ambassadors, Barillon and Rouvigny, in 1678?
 5. He speaks of the year 1696 as "the very nadir of English prosperity." For what reasons?
 6. Give the dates, and a short account of the different partitions of Poland.
 7. On what grounds does Mr. Knight defend the character of William III. with respect to the massacre of Glencoe?
 8. Write a sketch of the history of the newspaper press in England from its origin till the commencement of the present century.
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DR. TOLEKEN.

1. Discuss the question, whether the difference of origin and language sufficiently explain the great revolution in France at the close of the 18th century.
2. What, according to Hallam, constitutes the essential element of the feudal system; and to what causes does he attribute its establishment? State the views of Sir F. Palgrave and M. Lehueron on the subject.
3. What circumstances are mentioned by Hallam as favouring the aggrandizement of the Papacy in the 12th and 13th centuries? Give some account of the Canon Law.

4. Give a summary of the principal events which occurred in the reign of Francis II. of France, and describe the position of parties at his accession and death.

5. How does M. Guizot describe the fermentation of the human mind at the close of the 15th century, and what comparison does he draw between the policy of the Court of Rome and the Reformation?

6. What was the origin of the two Houses of Austria, and how long did they continue in the direct line? Show how the disunion amongst the German princes favoured the aggressions of France, and describe her acquisitions at the expense of Germany.

7. Give a short account of the struggles maintained by the Parliaments (1) against Royalty, (2) against the Clergy.

8. State the most important occurrences in the history of France in connexion with the papacies of Alexander VI., Sixtus V., Innocent XI., and Clement XIV.

LAW.

DR. LONGFIELD.

1. Are the Civil and Canon Laws properly classed among the *leges scriptæ*, or *leges non scriptæ*? and why?

2. State the most important general rules to be observed in the interpretation of Acts of Parliament.

3. Is the right of inheritance a natural right, or a right depending entirely on municipal law? Give the reason of your opinion, briefly.

4. Money is bequeathed to a man and the heirs male of his body; he survives the testator, but does not receive the legacy; who is entitled to it on his decease?

5. If an infant under the age of twenty-one years accepts a bill in consideration of necessities supplied to him, will that bill bind him? State the reason?

6. Can a lunatic bind himself by a contract? Is his disability in this respect greater or less than that of an infant?

7. What exception is there to the general rule, that, a corporation can enter into a binding contract only under its common seal?

8. What qualification is there to the general rule, that, if an agent makes a contract in his own name for sale of certain goods, the principal may adopt and enforce the contract, as if he had made it himself?

9. What is the meaning of marriage brokerage contracts? are they valid, or void? and for what reason?

10. What was the old law on the subject of the marriage of a man with the sister of his deceased wife, and the reason of that law?

11. A married woman has greater privileges in a court of equity than in a court of law?

12. What are the differences between a court of record, and a court not of record?

13. In what class of crimes can there be accessaries? and can there be an accessary before the fact in every case of felony?

14. What is the meaning, and what the effect of "reduction into possession" of a wife's chose in action?

15. What is necessary to make a recital in a deed operate as an estoppel against a party seeking to contradict that recital?

POLITICAL ECONOMY.

MR. M'DOWELL.

1. According to A. Smith, what are the conditions necessary that there should be an equality in the whole of the advantages or disadvantages of the different employments of labour or stock?

2. Rent, when paid for the land itself, and not for the improvements made in it by labour, is not a productive expenditure?

3. How does Mill reconcile the high wages in America with Ricardo's law of profits?

4. When will the use of machinery raise the general rate of wages, when lower it, and when leave it unaltered?

5. It is the interest of the labourer that revenue should be spent on commodities rather than on services?

6. What would be the effect on profits, wages, and rents, of an improvement in a manufactured article consumed by the labouring class?

7. Corn is a more accurate measure of value in different ages than any other commodity, according to Adam Smith.

8. How are the interests of the labourer, the capitalist, and the landlord connected with the general interest of the society?

9. Show that every country gets its imports at less cost in proportion to the general efficiency of its labour.

10. The doctrine that competition of capital lowers profits by lowering prices is incorrect in fact and unsound in principle?

PROFESSOR INGRAM.

Subjects for English Composition.

1. The influence of Character on Language, and the reflex action of Language on Character.

2. The art of Translating.

3. Compare the great English poets with respect to their sympathy with Nature, and their truthful and lively depiction of natural scenes.

4. It has been said that Pope is second only to Shakspeare in "the extent to which his lines are quoted as familiar maxims and illustrations of the daily incidents of life, and the common meanings of men." Give as many examples as you can of these pithy sentences, and show to what characteristics of his genius his success in producing them is to be attributed.

5. Characterize the prose styles of Milton, Clarendon, and Bolingbroke.

6. State distinctly the peculiar merits of Defoe, Walpole, Richardson, Sterne, and Miss Austen, as authors of prose fiction.

ENGLISH LANGUAGE AND LITERATURE.

PROFESSOR INGRAM.

1. Write notes on the derivations of the following words:—Argosy, bumpkin, dormouse, kernel, liquorice, livelihood, stairs, uproar, vermilion.

2. What Greek and Latin words are etymologically akin to the following:—Be, brow, full, hide (the *noun*), hound, pea (cock), snow, tooth, wit?

3. Explain the terminations of these names:—Cherts-ey, Greenwich, Hampstead, Harbottle, Mapletorpe, Nottingham, Somerset, Shoebury-ness, Wansbeck, Windermere.

4. Write philological notes on the italicized words and forms in the following passages:—

a. "I take that me God *an*."

b. "A stern geaunt is he, of whom thou *owest* to drede."

c. "Never ne *dought* him day,
For sorrow he had o' night."

d. "They tweyne *runnen* togider, and thilk other disciple *ran* before Petir."

e. "*Lewede* men *cunne* French non,
Amongst an hondred *unnethis* on."

f. "Of woodcraft *coude* he well alle the usage."

g. "That unto logike *hadde* long *ygo* (or *ago*)."

h. "But *draweth* cutte, or that we farther *twinne*."

i. "But of his *chere* did seem too solemne *sad*."

j. "The elfin knight, which *ought* that warlike wage."

k. "Through unadvized rashness *worzen* wood."

l. "*I wis* your grandam had a worsere match."

m. "An ancient fabric. . . Barbican it *hight*."

n. "A Scot still, *but* blot still,
I knew nae higher praise."

5. Mr. Craik, in a passage relating to the "clowns, fools, and simpletons" of Shakspeare, thus enumerates them: "Malvolio, and Shallow, and Slender, and Dogberry, and Verges, and Bottom, and Lancelot, and Launce, and Costard, and Touchstone, and a score of others." In what plays do the persons here named respectively appear?

6. Mention from which of Shakspeare's plays each of the following sentences is taken, by whom each is spoken, and to whom addressed, in the

place where it occurs. Also, explain all the allusions, and comment on such phrases as call for notice :—

- a. "No, truly, Ursula, she is too disdainful;
I know her spirits are as coy and wild
As *haggards* of the rock."
- b. "What a dish of poison has she dress'd for him!
And with what wing the *stannyl checks* at it!"
- c. "Thus goes every one to the world but I; and I am *sunburned*."
- d. "O God's will! much better
She ne'er had known pomp. Though it be temporal,
Yet if *that quarrel fortune* do divorce
It from the bearer, tis a sufferance, panging
As soul and body's severing."
- e. "That which is now a horse, even with a thought
The rack dislimns; and makes it indistinct
As water is in water."
- f. "If he have power,
Then *vail* your ignorance; if none, *awake*
Your dangerous lenity."
- g. "The skipping King, he ambled up and down
With shallow jesters, and rash *bavin* wits
Soon kindled and soon burn'd."
- h. "My better parts
Are all thrown down, and that which here stands up
Is but a *quintain*, a mere lifeless block."
- i. "Antony
Shall be brought drunken forth; and I shall see
Some squeaking Cleopatra *boy my greatness*
I' the posture of a whore."
- j. "It pleas'd the King, his master, very late,
To strike at me upon his misconstruction;
When he, *compact*, and flattering his displeasure,
Tripp'd me behind: *being down*, insulted, rail'd,
And put upon him such a deal of man,
That *worthy'd* him, got praises of the King
For *him attempting* who was *self-subdued*." . .
- k. "Your *sum of parts*
Did not together pluck such envy from him
As did that one; and that, in my regard
Of the unworthiest *siege*. . . The *scrimers* of their nation,
He swore, had neither motion, guard, nor eye
If you oppos'd them."
- l. "All furnish'd, all in arms:
All plum'd, like estridges, that *with the wind*
Bated, like eagles having lately bath'd."

7. Explain the italicized words in the following quotations from Shakespeare and Milton :—

- a. "This is clean *kam*."

- b. "Tell him from his *all-obeying* breath I hear
The doom of Egypt."
- c. "'Tis in *grain*, sir ; 'twill endure wind and weather."
- d. "For Hector, in his blaze of wrath, *subscribes*
To tender objects."
- e. "And every shepherd *tells his tale*
Under the hawthorn in the dale."
- f. "Till *civil*-suited morn appear."
- g. "*Storied* windows richly dight."
- h. "The *squandering* glances of the fool."
- i. "*Immoment* toys, things of such dignity
As we greet *modern* friends withal."
- j. "The *farsed* title running 'fore the King."
- k. "Labienus . . hath
Extended Asia from Euphrates."
- l. "With *unexpressive* notes to Heaven's new-born heir."

8. Name the authors (or supposed authors) of the poems which begin with the lines quoted below, and write out such portions of them as you remember :—

- a. "The glories of our birth and state."
- b. "Drink to me only with thine eyes."
- c. "Go, soul, the body's guest !"
- d. "Oh fairest flow'r, no sooner blown but blasted."
- e. "Go, lovely rose !"
- f. "Sweet day ! so cool, so calm, so bright."
- g. "He who loves a rosy cheek."
- h. "Cupid and my Campaspe play'd."
- i. "Why so pale and wan, fond lover ?"
- j. "Gather the rosebuds while ye may."
- k. "Tell me not, sweet, I am unkind."

9. From what English authors, and from which of their writings, are the following celebrated passages taken ? What is the nature of the context in each case ?

a. "Methinks I see in my mind a noble and puissant nation rousing herself like a strong man after sleep, and shaking her invincible locks ; methinks I see her as an eagle mewing her mighty youth and kindling her undazzled eyes at the full midday beam." . . .

b. "Certainly I must confess mine own barbarousness ; I never heard the old song of Percy and Douglas, that I found not my heart moved more than with a trumpet." . . .

c. "But the age of chivalry is gone. That of sophisters, economists, and calculators has succeeded ; and the glory of Europe is extinguished for ever. . . . The unbought grace of life, the cheap defence of nations, the nurse of manly sentiment and heroic enterprise is gone !"

d. "Of Law there can be no less acknowledged than that her seat is the bosom of God, her voice the harmony of the world; all things in heaven and earth do her homage—the very least as feeling her care, and the greatest as not exempted from her power." . . .

e. " . . . The man is little to be envied whose patriotism would not gain force on the plains of Marathon, or whose piety would not grow warmer among the ruins of Iona."

10. The names of the following places are associated with the memories of certain eminent men of letters:—Beaconfield, Dryburgh Abbey, Ellisland, Fonthill, Golden Grove, Hagley, Hawthornden, Kilcolman, The Leasowes, Lissoy, Lochnagar, Moor Park, Olney, Penshurst, Strawberry Hill, Streatham, Twickenham?

The Candidates were further examined vivâ voce, as follows, on the English Language and the History of English Literature:—

1. According to Sharon Turner's estimates, there would be at least three English writers more un-Saxon than Johnson?

2. What is the proportion of Saxon (or pure English) words in the total vocabularies of Shakspeare, Milton, and the translators of the Bible?

3. What is the most serious kind of loss which our language has sustained in ceasing to be pure English?

4. In the use of archaic language, what caution is necessary? What example does Mr. Marsh give of the appropriate use of it?

5. Spenser's archaisms are often faulty?

6. At what number may we estimate all the words in the English vocabulary? How many are used by Shakspeare and Milton?

7. By what case does Mr. Marsh show the superiority of Anglo-Saxon to English in the power of derivation and composition?

8. By what cases does Mr. Marsh illustrate the influence of local conditions on the use of words?

9. The word *bribery* he mentions as reflecting accurately a change which has taken place in our social condition?

10. "What mister wight is that?" Explain this question, which is often found in our old writers?

11. Words which have come into sudden prominence are apt to be repeated *ad nauseam*. Of what word does this seem to have been true in Shakspeare's time?

12. "The future progress of our speech, it may be hoped, will bring back to us many a verbal Rip van Winkle." Explain the allusion here.

13. What want is common to the verb in all the Teutonic tongues?

14. What grammatical error and vulgarism mars the fine passage with which "Childe Harold" closes?

15. Is there a passive in any Teutonic tongue? and, if so, how is it formed?

16. This is one of the few cases in which we can with certainty explain an inflexion. There is one good case, also, in the English verb, and one in the Romance verb?

17. Dr. Latham has said, "The earlier the stage of a language is, the greater the amount of its inflexional forms." Is this true?

18. What two causes of linguistic revolution appear to Mr. Marsh sufficient to account for quite as great changes as have actually taken place in the speech of Europe?

19. State the general principle of the effect of inflexion on accentuation.

20. *It* used sometimes to be employed as a possessive, before the introduction of *its*. Where have we an example of this in Shakspeare?

21. Mr. Marsh remarks that the attention of English scholars was drawn, at a very early period, to the relations between sounds and signs, or, in other words, to systems of orthography. How may this be shown, and how may we account for it?

22. The ordinary spelling of the word *rhyme* is incorrect. Whence has the error arisen?

23. Sir Philip Sidney complains of contemporaneous rhyming poets, that "one verse did but beget another." Of what English poet of the last generation does Mr. Craik make the same remark?

24. What effect does the frequent use of double or polysyllabic rhymes tend to produce on our language?

25. What is *assonance*? and of what European literature is it characteristic?

26. Our language has abandoned a subtle distinction which used to prevail between *yea* and *yes*, *nay* and *no*?

27. A distinction regulating the use of *since* and its cognates sprang up just when that of *yea* and *yes* was disappearing?

28. The astonishing diversity of duplicates of common words found in the vocabularies of certain arts is exemplified by a curious passage from an early writer?

29. What is the simplest explanation of the phrase, "the house is a building"?

30. "Civilization" is a recent word. How does this appear?

31. Boucher speaks of the verbs "to advocate" and "to progress" as recent Americanisms. Is he correct in this?

32. Give examples in English of what the Germans call *umlaut*.

33. Who was Giraldus Cambrensis? and how is his name connected with the history of Ireland?

34. What two influences from without acted on the Northern French poetry at the epoch of its origin?

35. What foreign influence does Mr. Craik suppose to have affected the Provençal poetry?

36. What "notes of time" are to be found in the Brut of Layamon?

37. The Brut of Layamon and the Ormulum may be regarded as representing two coexisting and different forms of the national language?

38. In what does Layamon's English differ remarkably from that of the "Ancren Riwele"? How may this difference be accounted for?

39. What characteristic of Chaucer's heroic verse has been remarked on by Leigh Hunt? Whence did Chaucer probably borrow this feature?

40. Mr. Craik notices one of the characters in the Canterbury Tales as being "admirably sustained throughout"?

41. What passage does Mr. Craik quote to show the depth and delicacy of Chaucer's pathos?

42. At what result does Mr. Marsh arrive from a comparison of the vocabularies of Langland and Chaucer?

43. A statement made by Caxton shows remarkably the change which had been going on in the English language during the earlier half of the fifteenth century?

44. Whom does Hallam name as the earliest among eminent English writers who had largely imbibed the spirit and tone of the philosophers of antiquity?

45. What work of Sir Philip Sidney did Horace Walpole profess to consider the best specimen of his abilities?

46. How is the brother of the poet Herbert known in our literature?

47. "Characters" were once a favourite species of composition. What English authors have produced works of this kind?

48. What biographies were written by Izaak Walton?

49. Two Harringtons meet us in the history of English Literature [rather, a Harrington and a Harrington]?

50. Of all the cavalier poets, who did his cause the heartiest and stoutest service?

51. Who is believed to have been the original of Hudibras?

52. On what book, according to Lord Macaulay, might the character of what is called the old unpolluted English language be safely staked?

53. In what passage does Bunyan appear to satirize the conduct of State trials in the time of Charles II.?

54. Under what name does Sir Edward Seymour appear in "Absalom and Achitophel"?

55. "But hospitable treats did most commend
Wise Issachar, his wealthy western friend."

Who was the person here referred to?

56. Who is the Helon of the second part of "Absalom and Achitophel"?

57. Who are the Ziph and Shimei of the same poem?

58. Who is Sheva? What is the special significance of the line relating to him,

"Observes and shoots their treasons as they fly"?

59. What was the name originally given by Pope to the Epilogue to his Satires?

60. What remarkable book appeared on the same day with the first of these Dialogues?

61. The "humble Allen" of Pope was the original of a celebrated character in English prose fiction?

62. Near the end of the "Dunciad" Pope has the line,

"Even Palinurus nodded at the helm."

What is the point of this line?

63. *"Or, at the ear of Eve, familiar toad,
Half froth, half venom, spits himself abroad."*

Of whom is Pope here speaking? and who is intended by Eve?

64. *"Ask you why Phryne the whole auction buys?
Phryne foresees a general excise."*

Who is Phryne?

65. What was the nature of Lauder's forgeries, and by whom were they exposed?

66. Who brought to light Sterne's many plagiarisms? He borrowed largely from an earlier English author?

67. What earlier writer had anticipated the manner of Moore in his "Fudge Family"?

68. *"Like angels' visits, few and far between."*

From whom did Campbell borrow this line, changing it, not for the better?

69. Blair was not the original author of the thought?

70. What are the principal poetical works of James Montgomery?

71. Who was the author of "Plays on the Passions"?

72. Who was the subject of Moore's song beginning,

"I saw thy form in youthful prime"?

By what work is she known?

73. What are the most remarkable poetical and prose writings of John Wilson?

74. What are the most remarkable characteristics by which the literature of the Victorian era is distinguished from that of the period which preceded it?

75. Whom does Mr. Craik name as the only really eminent poets of the Victorian era?

Moderatorships in Logics and Ethics.

Examiners.

JAMES HENTHORNE, TODD, D. D.
HEWITT R. POOLE, M. A.
BENJAMIN DICKSON, D. D.
THOMAS K. ABBOTT, M. A.

LOGICS.

MR. POOLE.

1. Discuss the importance of a sound education in connexion with natural religion ; and show how our views in reference to that religion may be influenced by education.
2. Hamilton thinks that in every state of the mind the same elements may be traced. Discuss this view, and examine how far these elements are separable, or not, in conception ? and how they are related to each other.
3. State accurately the ingenious arguments urged by M. Jouffroy to prove that the mind is *always* active in *sleep* ; and examine how far they are opposed to Stewart's views ?
4. State clearly the various distinctions drawn by Hamilton between *immediate* and *mediate* knowledge ; and whether these have been for the *first* time noticed by him ?
5. Hamilton points out facts connected with the phenomena of *remembrance* which ordinary explanations by *association* fail to account for. State as fully as you can his explanation of those facts, noticing the *illustration* which he introduces in order to make it intelligible ; and the principles on which he accounts for the *vividness* of some notions.
6. Hamilton divides "the primary elements of reason," or "laws of thought," into *two* classes. State accurately the distinctions which he seeks to draw between them ; and explain the expression, "the law of the conditioned."
7. State Hamilton's arguments in favour of resting the causal judgment on a *negative impotence*, instead of on a *positive power*, of the mind.
8. What is Thompson's view as to the true question in dispute between the Realists and Nominalists ? He gives instances in support of it ?
9. Give Thompson's discussion of the question, "Whether a philosophic criterion of truth is possible ?" How far is it valuable ?
10. Give a short statement as to how far, in your opinion, *innate ideas* seem to have a legitimate foundation, and your reasons for thinking so ?
11. Gravesande, as quoted by Stewart, in his strictures on Leibnitz' view of the impossibility of mind and body directly influencing each other, makes some valuable observations ?
12. To what does Bacon attribute the minute study of syllogism ? He points out the dangerous tendency in men's minds which gives rise to it ?

DR. DICKSON.

1. Determine by quotations from Locke's Essay the functions assigned by him to Reflection. State, also, and refute, the charges of confusion and inconsistency brought against him by Reid, Stewart, and Cousin.
2. Criticise from Mansel's point of view the position defended by Stewart, that demonstrative evidence depends upon the employment of hypotheses and definitions as principles.
3. How has Mansel defended Logic from the charge of being either futile or false?
4. Determine separately, and in detail, the *forms* of the concept proper and of the judgment.
5. On what grounds does Mansel exclude from the latter *relation* and *modality*, which have been added to them by the school of Kant?
6. Trace and expose the errors which have arisen in consequence of philosophers confounding the Aristotelian and the Baconian Induction.
7. Give the substance of Mr. Mill's observations upon the explanation of the laws of Nature.
8. It may be proved that Locke anticipated Kant in the recognition of the distinction between rational and empiric knowledge, as well as in the recognition of the criterion by which they are to be distinguished?
9. Review the opinions of philosophers respecting the nature and formation of Abstract Ideas.
10. Write an abstract of Cousin's "Classification of Philosophical Questions and Schools," and criticise his mode of handling the subject.

ETHICS.

DR. TODD.

1. Give an account of the ethical system of Dr. Mandeville, and point out its fallacies.
2. State briefly Smith's theory of the "Moral Sentiments;" and account, on his principles, for the origin of our sense of merit and demerit.
3. Explain the following phrases as they are used by Aristotle:—
 - (a.) ἀρετὴ ἠθικὴ.
 - (b.) σοφία.
 - (c.) πρόνοιας.
4. Write a criticism on the Aristotelic μεσότης, and its connexion with his ethical system.
5. Give an accurate account of Aristotle's views on the doctrine of final causes.

MR. ABBOTT.

1. Give an account of the historical genesis of Plato's ideal theory
2. Discuss the place of the emotions in a Platonic system.

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3. State and explain the allegory of the cave, and apply it to exhibit the progressive discipline which Plato had in view.
 4. Explain the relation of the ideas to the human reason.
 5. Show how Plato's ethics are connected with his conception of the soul.
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1. Give some account of the principles on which Hobbes was opposed by Cumberland, Cudworth, and Clarke, respectively.
2. What philosophers before Butler approached the truth on the subject of Disinterested Affection, and in what respects?
3. Butler, in several passages of his Sermons, countenances the opinion that the character of God is one of simple goodness. In connexion with what arguments is this opinion introduced?
4. State the theory of Butler's method of ethical inquiry, and the principles of its practical application.
5. "Must we, forgetting our own interest, go out of ourselves, and love God for His own sake?" Give Butler's reply to this question.
6. Discuss briefly the question concerning a primitive revelation.
7. Describe accurately the train of argument by which Butler shows the credibility that this life is a state of discipline for a future.

UNDERGRADUATE HONOR EXAMINATION PAPERS.

Michaelmas Term.

JUNIOR SOPHISTERS.

Mathematical Physics.

DR. SALMON.

1. How is an observatory clock set to the true sidereal time? If there were reason to believe that the right ascension of no star had yet been determined with sufficient accuracy, how should we proceed?
2. How is the time of the Moon's rising on a given day found? How does the problem differ from that of finding the time of rising of a star?
3. The deviation of a ray of light passing through a thin lens is constant?
4. Find when the deviation of a ray of light is a maximum or minimum, which enters a sphere, and emerges after n internal reflexions.
5. Find the centre of gravity of a shell whose bounding surfaces are non-concentric spheres whose radii are a, b , the distance of the centres being D .
6. Find the principal parameter of the parabola described by a body projected along a smooth plane of given inclination, with a given velocity, and at a given elevation.

DR. SHAW.

7. The Sun was observed to pass the meridian at $11^h 59^m 18.7^s$ by chronometer, the equation of time being $+13^m 22.5^s$. Required the error of the chronometer both for apparent and for mean time.
8. What are the principal quantities given in the Nautical Almanack?
9. A body falls from a given point towards a centre of force, the attraction at any distance r being $\frac{\mu}{r^2}$. To find the whole time of descent.
10. The centrifugal force of the Moon in her orbit is 0.00889 feet per second, while the centrifugal force of bodies at the Earth's equator is 0.11126 feet per second. Hence, and from the periodic time of the Moon, viz., 27 days, 7 hours, 45 minutes, calculate her mean distance from the Earth, in terms of the Earth's mean radius.

11. Compare the whole pressures on the curved surface and plane base of a solid hemisphere, radius r , immersed in water with its base horizontal, and at a depth r , the hemisphere being placed successively with its base down and up.

12. Find the magnifying power of a refracting astronomical telescope whose object-glass is of 12 feet focal length, and eye-glass of $\frac{1}{2}$ inch, used by a person whose least distance of distinct vision is 4 inches.

MR. WILLIAMSON.

13. Find how much the time of a star's rising is altered by refraction.

14. Find when the equation of time caused by the obliquity of the ecliptic is a maximum; and also its maximum value arising from the unequal motion in the ecliptic.

15. Determine the positions of equilibrium of an isosceles triangular prism floating with its vertex downwards and its edges horizontal; and investigate whether they are stable or unstable.

16. Determine the dispersion of a ray of light produced by transmission through two prisms placed in any manner towards each other.

17. A train moving at the rate of 20 miles an hour comes to the foot of an incline of 1 in 250; find how far it will ascend, steam being shut off, and resistance 8 lb. per ton.

18. Find the angle at which a body must be projected from a point in an inclined plane, in order to impinge upon the plane at right angles; the plane of projection being perpendicular to the inclined plane.

DR. SALMON.

1. A cistern of height b is filled with water, and a hole is made in the side at a height z ; find the point at which the issuing fluid strikes the floor on which the cistern stands.

2. Prove that when a prism is in the position of minimum deviation,

$$\mu = \frac{\sin \frac{1}{2}(\theta + \epsilon)}{\sin \frac{1}{2}\epsilon};$$

also, if θ' , θ'' be the minimum deviations of the extreme red and violet rays, explain by what measurements θ' , θ'' are found.

3. Given the lengths of a degree of the meridian commencing latitude L and commencing latitude L' ; find the equatoreal and polar diameters of the Earth.

4. Deduce formulæ for the effects of aberration on the right ascension and on the declination of a star.

5. Write down the differential equations of the motion of a projectile, the resistance of the air being supposed proportional to the square of the velocity, and integrate them once.

DR. SHAW.

6. Prove the following formulæ for the latitude (λ) and longitude (l) of a star S :

$$\sin \lambda = \frac{\sin (\phi - \omega) \sin \delta}{\sin \phi},$$

$$\tan l = \frac{\cos (\phi - \omega) \tan \alpha}{\cos \phi},$$

$\alpha = YD$, right ascension of star,

where $\phi = \angle SYD$,

ω = obliquity of ecliptic.

7. Determine the coefficient of friction between a rough body and an inclined plane, in terms of the angle of elevation, from observing that the least force that will suffice to move the body up the inclined plane is n times the least force that will sustain it on the plane.

8. Show that the condition that two prisms, each of which is placed in the position of least deviation, should form an achromatic combination, is

$$\mu' \Delta \mu \tan \phi' + \mu \Delta \mu' \tan \phi'' = 0.$$

9. Show that the longitudinal aberration of parallel rays, in a spherical refracting medium is

$$\frac{-x^2}{2(m-1)^2 f};$$

x being the semiaperture, f the focal length, and m the ratio of $\sin i$: $\sin r$.

10. A rectangle has one side in the surface of a fluid; show that the depths of the horizontal lines which divide it into n parts, on which the pressures are equal, are

$$H \sqrt{\frac{1}{n}}, H \sqrt{\frac{2}{n}}, H \sqrt{\frac{3}{n}}, \text{ \&c.}$$

MR. WILLIAMSON.

11. If a plane area be immersed in a vertical position in a fluid, prove that the co-ordinates of its centre of pressure, referred to the principal axes of its area at centre of gravity, are

$$\frac{k^2}{h} \cos \theta \text{ and } \frac{k'^2}{h} \sin \theta;$$

where k and k' are its principal radii of gyration, h depth of centre of gravity, and θ angle made by one of the principal axes with the vertical line.

12. A body is describing a conic round a centre of force at the focus; if, when it arrives at the extremity of its axis minor, the central force be suddenly doubled in intensity, show how to construct the subsequent path described.

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13. Prove that the aberration of an inferior planet is a maximum when in conjunction; and give a geometrical construction for the case in which it vanishes.
14. A bent lever, whose sides are inclined at a given angle, makes oscillations in its own plane about the angular point; find the length of the isochronous simple pendulum.
15. Find the caustic of a parabola when the rays are incident in a direction perpendicular to its axis.

Experimental and Natural Science.

ELECTRICITY AND MAGNETISM.

MR. GALBRAITH.

1. Let ten jars of equal dimensions be charged by cascade, and then placed in battery arrangement; compare the power of the battery with what it would have if charged directly.
2. Explain the theory of the condenser, and show how its condensing power may be found numerically by means of a proof-plane and a torsion-balance.
3. In comparing the accumulation of electricity at different points of an insulated conductor by means of the proof-plane and torsion-balance, how is the loss of charge eliminated from the result by means of alternate contacts?
4. What is the distribution of free electricity at the surface of elliptical conductors? Derive this from the ordinary hypothesis of a compound fluid.
5. State Faraday's view of electro-chemical decomposition, and his objections to Grotthius's theory founded on the specific difference of electrical character of chemical atoms.
6. State and explain Faraday's proposed nomenclature for expressing the parts of a battery, and the results of electro-chemical decomposition.
7. Give a diagram explanatory of Grove's gas battery.
8. Describe and explain the curvilinear arrangement which iron filings assume under the joint action of the poles of a magnet.
9. Deduce the geometrical property of these magnetic curves, and state the method of constructing them by points.
10. Pouillet gives the following experiment of Coulomb's:—A small proof-needle oscillates under the action of the earth 15 times in a minute; when brought under the influence of a magnetic pole at a distance of 4 in. it makes 41 oscillations in a minute; at a distance of 8 inches, under the influence of the same pole, it makes 24 oscillations; from this derive the law of magnetic force.

LIGHT AND SOUND.

PROFESSOR HAUGHTON.

1. A convexo-concave lens is made of Canada balsam (refractive index = 1.549), and the radii of its surfaces are 5 in. and 10 in.; find its focal length.

2. Given the object speculum of a Gregorian telescope of 3 ft. focal length, and the eye-piece of 1 in. focal length; find the focal length of the secondary concave mirror that will render the telescope capable of magnifying distant objects 700 times.

3. Give Huyghens' construction to determine the direction of the two refracted rays in a crystal of Iceland spar.

4. Investigate a formula to determine the position of the bands produced by the diffraction of light passing the straight edge of a screen.

5. Explain the manner in which the wave-lengths corresponding to the fixed lines of the spectrum may be found, by means of the spectrum formed by diffraction.

6. Explain accurately the mechanical principles by which Young accounted for the existence of a *bright* and not a *dark* centre in the experiment of Newton's rings.

7. An organ pipe (A) gives a note corresponding to 32 vibrations per second, and a second pipe (B), when sounded with the first, makes 40 beats in 20 seconds; find the number of vibrations per second made by pipe (B).

8. State the relative number of vibrations made in a given time by each note of a musical octave.

9. By what experiments is it shown that two lights may produce darkness; two sounds, silence; two heats, cold; and two motions, rest?

10. Find the focus of parallel rays passing through two spherical refracting surfaces; the incident rays being parallel to the line joining the centres.

HEAT.

DR. APJOHN.

1. Assuming, on the authority of Faraday, that liquid carbonic acid has, at 32°, the specific gravity of 0.83, and at 86° the specific gravity of 0.60, what must be its coefficient of expansion for 1° Fahr.?

2. What is the unit of heat usually defined to be? what is its mechanical equivalent? and how was this latter calculated by Mayor of Heilbronn?

3. In a perfectly dry atmosphere what is the relation between the depression of temperature shown by a wet and dry thermometer, and the force of vapour of maximum density at the temperature exhibited by the former instrument?

4. Five cubic inches of absolute alcohol, at the temperature of 40°, were mixed with two cubic inches of metallic filings at 80°, and the temperature of the mixture was found to be 41°.37. Assuming that all the

heat lost by the metal was confined to the water, what must have been the specific heat of the former?

N. B.—Specific gravity of alcohol = 0.794; specific heat of alcohol = 0.640.

5. Into 3 lbs. of water, at the temperature of 18° , 1.38 lbs. of granulated zinc, at 80° , were projected, as a consequence of which some of the water was congealed. How much of it underwent this change?

N. B.—Specific heat of zinc = 0.0955; caloric of liquidity of water = 142.65 .

6. m lbs. of water at t , when added to m' lbs. of ice at t' , give a liquid mixture whose temperature is θ . From these data, and the specific heat of ice, c , calculate the caloric of the liquidity of water.

7. The mean coefficients of the cubic expansion of mercury, and of the linear expansions of copper and platinum being—

	Between 32° and 212° .	Between 32° and 572° .
Mercury, . . .	0.018018	0.018911
Copper, . . .	0.001719	0.001883
Platinum, . . .	0.000884	0.000918

When the true temperature of a medium is 572° , what will it be if taken by an ordinary mercurial thermometer, and by thermometers of copper and platinum working by linear expansion?

8. Explain the experimental process, and the method of calculation employed by De la Roche and Berard in comparing the specific heats of air and water.

9. Bunsen has proposed and practised an indirect method for taking approximately the specific gravity of a gas when the volume of it is too small to admit of a resort to the ordinary process by weighing. What is the method in question, and the principle on which it rests?

10. What are the laws connecting the latent and the sensible heats of aqueous vapour of maximum density at different temperatures—according to Southern, according to Watt, and according to Regnault?

History and English Literature.

HISTORY.

PROFESSOR BARLOW.

1. Write a short account of the life and adventures of Egbert before his accession to the throne of Wessex.

2. According to Hallam, the history of the jurisdiction of the constable and marshal of England affords no bad illustration of the state in which our Constitution stood under the Plantagenets. Explain this assertion.

3. A remarkable precedent in the 9th of Henry IV. is perhaps the earliest authority for two important maxims of parliamentary law; what

maxims? Give some account of the contents of this important record. What inferences does Hallam deduce from it?

4. Relate the history of the invasion of England by James IV. of Scotland.

5. The most serious disagreement on record between the Crown and the Commons, from Henry IV. to Elizabeth, took place in 1566. Give an account of the proceedings on this occasion.

6. Write a sketch of the progress of Poor-law legislation under Elizabeth.

7. Give an account of the military operations in 1747 which led to the peace of Aix-la-Chapelle.

8. Relate, as fully as you can, the proceedings of the Convention of 1688.

9. Speaking of the great national delusion of the Popish plot, Hallam remarks that "there were circumstances, and some of them very singular in their nature, which explain and furnish an apology for the public error." What were these?

10. Write a short account of—

The Commercial Crisis of 1797.

The Methuen Treaty.

The trial of Horne Tooke.

ENGLISH LITERATURE.

PROFESSOR INGRAM.

1. Which of the following modes of spelling do you adopt, and for what reasons?—

a. chrysolite, chrysolyte.

b. gipsy, gypsy.

c. pedler, pedlar.

d. pigmy, pygmy.

e. sirname, surname.

f. siren, syren.

2. Remark on some meanings which the following words formerly bore, but which are now obsolete.—Absolute, admire, enormous, muse (the *verb*), nephew, painful, town.

3. Trace the following words to their source in the Latin language:—Agree, degree, damsel, espouse, limner, portrait, purlieu, suit.

4. Give a general view of English Literature from the death of Elizabeth to the Restoration.

5. Give as full an account as you can of the "Tale of a Tub," the "Battle of the Books," and the "Drapier's Letters."

6. Write a short biography of Pope. Give an account of his personal relations with his eminent contemporaries.

7. Characterize the genius of Burns. Mention some of the pieces which best exemplify his poetic gifts.

8. Write notes on the following extracts :—

- a. "At half mankind when generous Manly raves . . ."
- b. "Or turns *young Ammon* loose to scourge mankind."
- c. "Gold, *imp'd* by thee, can compass hardest things."
- d. "The *Silvans* groan—no matter—for the fleet."
- e. "What made . . .
A perjur'd prince a leaden saint revere,
A godless regent tremble at a star?"
- f. "Conscious they act a true *Palladian* part."

9. Who was the "Chloe" of Pope? What description has he given of the same person elsewhere?

10. Write short accounts of Blunt, Borgia, the Man of Ross, Villiers, Wharton, Wilmot.

11. Explain the allusions in the following passages :—

- a. "That small infantry warr'd on by cranes."
- b. "A leper once he lost, and gain'd a king."
- c. "And Lichas from the top of Æta threw
Into the Euboic sea."
- d. "O'er hill or moory dale
Pursues the Arimasbian."
- e. "Betwixt the justling rocks."
- f. "The dreaded name of Demogorgon."
- g. "Where Abassin kings their issue guard."
- h. "Or where Alcinous reign'd."
- i. "Where we possess the quarters of the north."

Classics.

ÆSCHYLUS.

MR. GRAY.

Translate the following passages into English :—

1. *Beginning*, καὶ τὸν σὸν αὐτ' ἀδελφον, ἐς πατρός μόνον, κ. τ. λ.
Ending, ἀφ' ἧς τὰ κεδνὰ βλαστάνει βουλευματα.

Theb. 572-590.

2. *Beginning*, τίπτε μοι τόδ' ἐμπίδωξ, κ. τ. λ.
Ending, οὐδ' ἐπόντισε σκάφος.

Ag. 948-983.

3. *Beginning*, καὶ προστρόπαιος ἐστίας μολὼν πάλιν, κ. τ. λ.
Ending, τραφέντα δ' αὖθις ἡ δίκη κατήγαγεν.

Ag. 1565-1585.

4. *Beginning*, τοιγὰρ κακῶς δράσαντες οὐκ ἐλάσσονα, κ. τ. λ.
Ending, λῆξαι θεοβλαβούνθ' ὑπερέκμπη θράσει.

Pers. 809-827.

1. Explain the following :—

τριτόσπονδος αἰών, ἄπτερος φάτις, νικᾷ δ' ὁ πρῶτος καὶ τελευταῖος δραμῶν, πιθανὸς ἄγαν ὁ θῆλυς ὄρος ἐπινέμεται, πάραυτα, ἀκασκαῖος, κάρβανος, ἐκμαρτυρεῖν, θεμερῶπις, προυσελούμενον, ἀήσυροι, ἰότατι, ἄρμοι.

2. What peculiar use have the aorist ἦνεσα and its compounds in the tragedians? What tense is similarly used in Latin?

3. Explain the use of μή with the participle in ἐκβαῖν' ἀπήνης τῆσδε, μὴ χαμαὶ τιθεῖς τὸν σὸν πόδ', &c.

4. Give an outline of the religious system held and inculcated by Æschylus.

5. Point out the social and political importance of the ancient theatrical representations.

6. Describe the arrangement of the Athenian dicasteries as constituted by Pericles and Ephialtes, and compare them with our jury system.

MR. ABBOTT.

Translate the following passages into English :—

1. *Beginning*, Ipse Deus solitus stabulis expellere vaccas, ...
Ending, Aspiceret, Phœbi quæreret ille comam.

TIBULLUS, *Eleg.* lib. ii. *Eleg.* iii. 15-30.

2. *Beginning*, Cum me Castalia speculans ex arbore Phœbus, ...
Ending, Qua nova muscoso semita facta solo est.

PROPERTIUS, *Eleg.* lib. iii. *Eleg.* iii. 13-26

3. *Beginning*, Nullus argento color est avaris, ...
Ending, Corpore languor.

HORACE, *Carm.* lib. ii. *Ode* ii. 1-16.

4. *Beginning*, Abacta nulla Veia conscientia, ...
Ending, Intabuissent pupulæ.

HORACE, *Epod. Liber*, *Ode* v. 29-40.

1. Write notes on the preceding passages where required.

2. Mention any metrical observances which distinguish the Alcaic and Sapphic metres of Horace, or the pentameters of Ovid and Propertius, from the corresponding Greek metres.

3. What Greek lyric poets did Horace imitate? Quote some of the passages in which he characterizes their writings severally.

4. State the principal laws of the Latin phonetic system, as regards—
 (a) the aspirates, (b) spirants, (c) assimilation and dissimilation of vowels, (d) hiatus within a word.

5. Give the etymology of *mones, terreo, sopio, ploro, lavo*.
6. What is the origin of the several forms of the Latin perfect?
7. How does it appear that the tendency of events in the latter period of the Republic was towards monarchy?
8. How was the despotism of the emperors practically limited? M. Meunier compares the working of the Roman Constitution under the empire with that of the British Constitution at present; in what respect are they similar.
9. Give an account of the administration of the senatorial and imperial provinces respectively.

MR. FERRAR.

Translate the following passages into Latin Hexameters:—

Beginning, It little profits that an idle king, ...

Ending, For ever and for ever as I move.

TENNYSON'S *Ulysses*.

Translate the following passage into Latin Prose:—

Beginning, There lurks, perhaps, in every human heart

Ending, an airy temper and a quick apprehension.

DR. JOHNSON to Boswell.

Translate the following passage into Greek Prose:—

Beginning, The members of the Government

Ending, and arranged all other matters concerning the forces as he pleased.

Translation of Thucydides.

Translate the following passage into Greek Iambics:—

Beginning, O how weak

Ending, Preaches the solemn lesson.

KIRKE WHITE, *Instability of Human Glory*.

SENIOR FRESHMEN.

Mathematics.

DR. SALMON.

1. If a conic pass through three fixed points, and cut a given finite line harmonically, it passes through a fourth fixed point?

2. Differentiate

$$\log \left(\frac{1+x}{1-x} \right)^{\frac{1}{2}} - \frac{1}{2} \tan^{-1} x,$$

and bring the result to the simplest form.

3. Integrate

$$\frac{\sin^3 x \, dx}{\cos^4 x}, \text{ and } x^3 \sin x \, dx.$$

4. Given a self-conjugate triangle with regard to a parabola, three tangents to the curve are given?

5. The portion intercepted between the axes of a tangent to an ellipse is a minimum; find its length.

6. Find an expression for the length of the line joining two feet of perpendiculars of a spherical triangle.

DR. SHAW.

7. Find the limit to which

$$x \tan x - \frac{\pi}{2} \sec x$$

approaches, as x approaches $\frac{\pi}{2}$.

8. Find the envelope of all the ellipses having the length of the line joining the extremities of their semiaxes constant, the axes being coincident.

9. Find the parameter of the parabola

$$9x^2 - 12xy + 4y^2 - 36x - 24y + 36 = 0,$$

the axes being rectangular.

10. Prove that in a parabola the distances of any point on the curve and its centre of curvature from the directrix are in the ratio of 1 : 3.

11. A teetotum of eight sides, numbered 1, 2, &c., is spun three times consecutively; what is the chance that it will fall on the numbers 2, 4, 7 in any order whatever?

12. Apply Horner's method to find to three places of decimals the root lying between 1 and 2 of the equation

$$x^3 - 3x - 1 = 0.$$

MR. WILLIAMSON.

13. Find the maximum and minimum values of

$$\frac{\tan^4 x}{\tan 4x}.$$

14. Find the integrals

$$\int \frac{dx}{(a^2 - x^2)^{\frac{3}{2}}}, \quad \int \frac{dx}{x(1-x)(3-x)}.$$

15. Given

$$y = \tan^{-1} \frac{\sqrt{1+x^2}-1}{x} + \tan^{-1} \frac{2x}{1-x^2},$$

find $\frac{dy}{dx}$.

16. Find the common root of the equations

$$x^4 + 2x^3 - 8x^2 - 7x + 14 = 0,$$

$$x^4 + 3x^3 - 16x^2 + 15x - 6 = 0.$$

17. Find the locus of the centre of a circle which makes given intercepts on two fixed lines.

18. Apply the method of projections to the following question :—

Through a given point a transversal is drawn cutting a conic, and the points of section are joined to two fixed points on the curve; find the locus of the intersection of the joining lines.

DR. SALMON.

1. Find the locus of the vertex of a triangle whose sides touch one conic, and whose base angles move on another.

2. The two parabolas which can be described through four given points, a, b, c, d , have as common tangents the lines joining the middle points of the sides of the triangle $(ab, cd), (ac, bd), (ad, bc)$?

3. By the ruler alone draw a tangent at any point on a conic.

4. Integrate

$$\frac{\sqrt{1-e^2 \sin^2 x}}{\sin x} dx; \quad \frac{dx}{(1-x^2)\sqrt{1-e^2 x^2}}.$$

5. If $y = a + x \sin y$, expand $\sin y$ in powers of x .6. If T and T' are the feet of the perpendiculars from the foci on the tangent at any point P of an ellipse, determine P so that $PT^2 + PT'^2$ shall be a maximum.

DR. SHAW.

7. Find in trilinear co-ordinates the equation of a conic touching the lines α, β, γ , and having its centre at a given point $\alpha'\beta'\gamma'$.

8. Prove the general expression in polar co-ordinates for the radius of curvature, namely,

$$\rho = \frac{\left\{ r^2 + \left(\frac{dr}{d\theta} \right)^2 \right\}^{\frac{3}{2}}}{r^2 + 2 \left(\frac{dr}{d\theta} \right)^2 - r \frac{d^2 r}{d\theta^2}},$$

and apply it to find the radius of curvature of the spiral $r = a\theta$.

9. Find the envelope to the series of parabolas determined by the equation

$$y = mx - (1 + m^2) \frac{x^2}{4c},$$

where m is the variable parameter.

10. Show that the absolute term in the equation to the squares of the differences of the roots of a biquadratic is

$$\begin{vmatrix} s_0 & s_1 & s_2 & s_3 \\ s_1 & s_2 & s_3 & s_4 \\ s_2 & s_3 & s_4 & s_5 \\ s_3 & s_4 & s_5 & s_6 \end{vmatrix}$$

11. Find *either* of the integrals,

$$\int \frac{d\theta}{(a + b \cos \theta)^2} \quad \text{or} \quad \int \frac{x^n dx}{(a + bx + cx^2)^{\frac{1}{2}}}.$$

12. Find the locus of the point in which the focal radius vector of an ellipse intersects the line drawn from the centre to the point $x', \frac{b}{a} y'$.

MR. WILLIAMSON.

13. Integrate the expression

$$\frac{(a' + b' \cos x + c' \sin x) dx}{a + b \cos x + c \sin x}.$$

14. Find the equation whose roots are $a\beta + \gamma\delta$, $\alpha\gamma + \beta\delta$, and $\beta\gamma + \alpha\delta$, where $\alpha, \beta, \gamma, \delta$ are the roots of the biquadratic equation

$$x^4 + px^3 + qx^2 + rx + s = 0;$$

and show that the result is the same as the reducing cubic in the ordinary method of solving the biquadratic.

15. Given of a conic one focus, two points, and a tangent, show that another tangent can be constructed; and hence the second focus found. State the number of solutions of the problem.

16. Determine the value of the radius of curvature at the origin to the curve

$$3y = 4x - 15x^2 - 3x^3 + x^4,$$

find also at what points the radius of curvature is infinite.

17. Find the whole area of the curve

$$\left(\frac{x}{a}\right)^{\frac{2}{3}} + \left(\frac{y}{b}\right)^{\frac{2}{3}} = 1.$$

18. Prove that the equation of a conic inscribed in a quadrilateral may be written in the form

$$L^2 = \frac{M^2}{\mu} + \frac{N^2}{1 - \mu}.$$

Logic.

STEWART'S DISSERTATION, AND BACON.

MR. POOLE.

1. The *optimism* of Leibnitz was necessary from his system? State its defects as compared with that of other philosophers.
2. State Spinoza's conception of the Deity as explained by Stewart; and the leading points of difference in it from that acknowledged by Christians?
3. What is Laplace's explanation of the *sufficient reason*? He misapprehends the Epicurean views according to Stewart. Explain the principle as applied to man's conduct.
4. How does Stewart state Kant's argument for man's *free will*, who rests his proof on *two* grounds? What is the condition of man's *responsibility*, according to Kant?
5. Locke says, "The next thing to be considered is how bodies produce ideas in us: and that is manifestly by impulse, the only way in which we can conceive bodies to act." Show that this may be explained without contradicting the fact of Locke being a conceptualist. The principle involved is one admitted by many philosophers?
6. Show that the system of metaphysical inquiry chiefly pursued involves the dangers arising from *idola specus*; and point out how this may be to some extent avoided.
7. State the curious views of Leibnitz on the subject of knowledge, as noticed by Stewart, which seem closely to resemble those of Plato.
8. Show that Idealism, in the English sense of the word, is the natural result of Kant's system.
9. To what sciences, according to Bacon, is syllogism applicable? Why does he reject it in the case of some other sciences? and what difference, which he alludes to, exists in the two classes?
10. State Bacon's instances of *idola tribus*; and the special cases which he adduces to illustrate each.

STEWART AND MANSIE.

DR. DICKSON.

1. State at length the views of the Realist and the Nominalist respecting Ideas. Mention the principal philosophers of these two sects, both ancient and modern, noting the opinion peculiar to and distinctive of each.
2. On what grounds does Mansel exclude the principle of the *sufficient reason* from the laws of thought?
3. How do the views of Stewart and Mansel differ respecting Perception, Conception, and Imagination?

4. Define and illustrate the difference between *positive* and *negative* thinking.

5. Explain the nature and origin of the scepticism of Berkeley and Hume.

6. Give Sir W. Hamilton's "analysis of the causal judgment, as the result of the mental law of the conditioned."

7. Give the substance of Stewart's observations upon the use and abuse of general principles in politics.

8. Classify and criticize the principal theories of the association of ideas.

9. How does Stewart explain the phenomena of dreaming?

10. In what respects do Locke, Stewart, and Mill differ respecting abstraction?

LOGIC AND PSYCHOLOGY.

MR. ABBOTT.

1. *a.* Reduce the reasoning in the following quotation to strict syllogistic form.

b. Name the mode of each syllogism.

c. If you discover any fallacy, indicate it.

"I suppose then that God is not extended. If so, I say there can be no external world. For if there be an external world, and if it be a creature, we must suppose that God is everywhere present in and with it, for He is supposed to preserve and do every thing that is done in it. To deny this is to shut Him out of the universe, even altogether to deny His being. On the contrary, to affirm that He is thus present with every part and particle of it is to make Him co-extended, which is contrary to the supposition."—ARTHUR COLLIER, *Clavis Universalis*, chap. viii.

2. State the following propositions in strict logical form; convert and contradict them.

a. Every father has been a son.

b. There are only ten predicaments.

c. James drinks nothing but water.

d. Te Deum laudamus.

3. What evidence have we of the existence of spirit and of spirits, according to Locke?

4. How does Locke prove the necessary existence of pure space? In what words is the element of necessity introduced?

5. Give a summary classification of philosophical questions according to Cousin's arrangement.

6. How is the passage from Psychology to Ontology effected, according to Cousin?

Classics.

HOMER.

MR. FERRAR.

Translate the following passages into English Prose :—

1. *Beginning*, "Ὡς φάτο, κώκυσεν δὲ γυνή καὶ ἀμείβετο μύθῳ, κ. τ. λ.
Ending, 'Ἔσταότ', οὔτε φόβου μεμνημένον οὐτ' ἀλεωρῆς."
Iliad, xxiv. 200-216.
2. *Beginning*, 'Ἢ, καὶ κυανέησιν ἐπ' ὀφρύσι νεῦσε Κρονίων, κ. τ. λ.
Ending, 'Ἐξω ἐγώ· τὸ δὲ οἱ κλέος ἴσσεται ὅσσον ἱμοί περ."
Ibid. xvii. 209-232.
3. *Beginning*, "Ὡς εἰπὼν, ἀπέπεμπε δόμων βαρὶα στενάχοντα, κ. τ. λ.
Ending, Καπνὸν δ' ὅλον ὀρώμεν ἀπὸ χθονὸς ἀίσσοντα.
Odyssey, x. 76-99.
4. *Beginning*, Παννύχιος φερόμεν· ἅμα δ' ἡελίῳ ἀνιόντι, κ. τ. λ.
Ending, Αὐτίς ἀριζήλως εἰρημένα μυθολογεῦειν.
Ibid. xii. 428-453.

1. What is the Wolfian theory with respect to the Homeric Poems, and what are the usual arguments against it?
2. Whence did the earliest interpolations arise?
3. Who were the chief Homeric critics in ancient times?
4. What are the distinguishing characteristics of the *Odyssey* as compared with the *Iliad*?
5. The *Iliad* was not originally written?
6. What was the Epic Cycle?
7. Why did Cleisthenes banish the Rhapsodists from Sicily?
8. What is Grote's view of the *Iliad*?
9. Historic Greece exhibits an improvement over Heroic Greece both in the affections and the intellect?
10. Compare the theology of Homer with that of Æschylus.
11. Why was Aletes so called?
12. Explain the formation of the words κτείνω (for κτείνω), εἶλον, δώσουσα, τεκμαίρομαι, ἐλαύνω, σχίζω, πράσσω.
13. What traces of the participle ending in μένος have we in Latin?
14. Analyze the words ἐκάτερος, πᾶς, and δημόσιος.
15. What was the original phonetic value of the Digamma? What letters took its place in the various Greek dialects?
16. Write down the dialectic variations in the declension of the personal pronouns, and account for each, if possible.

VIRGIL.

MR. GRAY.

Translate the following passages into English :—

1. *Beginning*, Quod superest, quæcumque premes virgulta per agros, . . .
Ending, Adsuescant, summasque sequi tabulata per ulmos.
Georg. ii. 346-361.
2. *Beginning*, Excipiunt plausu pavidos, gaudentque tuentes
Ending, Impediunt, texuntque fugas et proelia ludo.
Æneid, v. 575-593.
3. *Beginning*, Non ego te, Ligurum ductor fortissime bello, ...
Ending, Arduus, et longa sulcat maria alta carina.
Ibid. x. 185-197.
4. *Beginning*, Contra ego vivendo vici mea fata, superstes
Ending, Nec fas ; sed nato Manes perferre sub imos.
Ibid. xi. 160-181.
5. *Beginning*, Diripuerunt aras ; it toto turbida cælo
Ending, Concurrunt Itali, spolianteque calentia membra.
Ibid. xii. 283-297.

1. In what light does Merivale regard the Georgics and Æneid of Virgil ?
2. What reason does he suggest for Virgil's desiring that his unfinished poem should be destroyed ?
3. What, according to Conington, is the true relation of Virgil to Homer ?
4. Trace the influence of the Greek drama on the Æneid.
5. In one passage there is a distinct mention of Greek legends as they are treated in Greek tragedy ?
6. Describe the organization of the provinces of Spain and Gaul by Augustus.
7. From whence are the modern titles of the chief cities of France derived ? Give instances.
8. At the foundation of the empire of Augustus the communities of the world might be massed in three principal families ? State the political characteristics of each.
9. What were the elements of variety and of unity within the Roman empire ?

MR. ABBOTT.

Translate the following passage into Latin Prose :—

- Beginning*. The distinction here pointed out
Ending, the sight or knowledge of his conduct might corrupt or mislead.
 MILL, *On Liberty*, ch. 4.

Translate the following passage into Latin Verse:—

Beginning, "Hitherto, lords, what your commands imposed

Ending, The vulgar only scap'd who stood without.

MILTON, *Samson Agonistes*.

Translate the following passage into Greek Prose:—

Beginning, The more a nation conceives its gods to be like men, ...

Ending, constituent parts of their religious festivals.

HERREN, *Ancient Greece*, ch. 3.

Translate the following passage into Greek Verse:—

Beginning, "Thus judging, for a little space

Ending, Their sight like what I saw."

SCOTT, *Marmion*, canto iv. 20, 21.

JUNIOR FRESHMEN.

Mathematics.

A.

DR. SALMON.

1. If a, b, c, d be the sides of a quadrilateral inscribable in a circle, prove that the radius of the circle is given by the expression

$$4r = \sqrt{\left(\frac{(ab + cd)(ac + db)(ad + bc)}{(s-a)(s-b)(s-c)(s-d)} \right)}.$$

2. Find the condition that two of the roots of the equation

$$x^3 - px^2 + qx - r = 0$$

should be connected by the relation $\alpha\beta = k^2$; and hence find the condition that

$$y^3 - py^2x + qyx^2 - rx^3 = 0$$

should represent right lines two of which are at right angles to each other.

3. If a, b, c be the lengths of the sides of a triangle, and d, e, f the lines joining the vertices to any assumed point, prove that

$$a^2(d^2 - e^2)(d^2 - f^2) + b^2(e^2 - d^2)(e^2 - f^2) + c^2(f^2 - d^2)(f^2 - e^2) + a^2d^2(a^2 - b^2 - c^2) + b^2e^2(b^2 - a^2 - c^2) + c^2f^2(c^2 - a^2 - b^2) + a^2b^2c^2 = 0.$$

4. Let the distances of the point P from the points $y=0$, $x=\pm a$, be ρ , ρ' ; by what relation are ρ , ρ' connected if P be anywhere on the line $y=mx+n$?

5. Given the equations of two circles, find the co-ordinates of a centre of similitude.

6. Given the four sides of a quadrilateral, and that the sum of two opposite angles is ϕ , find an expression for the length of the diagonal opposed to these angles.

DR. SHAW.

7. Show that

$$\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}.$$

8. Show, by trigonometry, that the roots of

$$2x^3 - 3x - 1 = 0$$

are -1 , $\frac{1}{2}(1 \pm \sqrt{3})$.

9. Solve the equation

$$x^4 - 4x^3 + 3x^2 - 85x + 16 = 0,$$

the roots of which are in geometrical progression.

10. Find the value of the symmetric function

$$\Sigma \frac{a^2}{bc} \left(1 + \frac{b}{a}\right)^2 \left(1 + \frac{c}{a}\right)^2$$

of the roots of the equation

$$x^3 - 2x^2 + 4x - \sqrt{8} = 0.$$

11. Show that the area of the quadrilateral included between the four lines $y=ax$, $y=ax'$, $y=mx+c$, $y=m'x+c'$, is

$$\frac{1}{2}(a'-a) \left\{ \frac{c'^2}{(a-m')(a'-m')} - \frac{c^2}{(a-m)(a'-m)} \right\}.$$

12. Determine the inclination of the co-ordinate axes, in order that the equation

$$x^2 - xy + y^2 - ax - ay = 0$$

may represent a circle; and find its radius in magnitude.

MR. WILLIAMSON.

13. Prove that the equation

$$2x^2 + xy - y^2 - 2y - 11x + 15 = 0$$

represents two right lines, and find their equations.

14. If the sum of the squares of the perpendiculars from a point on the sides of a quadrilateral be constant, find the condition that the locus shall be a circle.

15. Prove, geometrically or otherwise, that if

$$\sin A + \sin B + \sin C = \frac{3}{2}, \text{ and } A + B + C = 90^\circ,$$

the only real solution is $A=B=C$.

16. Prove the trigonometrical identity,

$$\sin 5A \cos 5A - \cos 5A \sin 5A = \frac{1}{2} \sin 2A \cos 2A.$$

17. If
- $r^3 = p^2s$
- , the equation

$$x^4 + px^3 + qx^2 + rx + s = 0$$

can be solved as a quadratic.

18. The roots of the cubic

$$x^3 + px^2 + qx + r = 0$$

are a, b, c ; transform it into another whose roots are

$$\frac{a}{b+c-a}, \frac{b}{a+c-b}, \frac{c}{a+b-c}.$$

B.

DR. SALMON.

1. Express the equation

$$\sin 3\theta = \cos 2\theta$$

in terms of $\sin \theta$; and observing that 1 is a root of the resulting cubic, reduce and solve the equation.

2. Find the value of the symmetric function
- $\Sigma (a - \beta)^2$
- of the roots of the equation

$$x^3 - 4x^2 + 5x - 6 = 0.$$

3. What must be written instead of 6 for the last term of the preceding equation, if its roots are to be connected by the relation
- $\alpha + \beta = 2\gamma$
- ?

4. Find the co-ordinates of the intersection of perpendiculars of the triangle the co-ordinates of whose vertices are

$$(1, 2), (3, -4), (-5, 6).$$

5. A circle passes through the point
- $(1, 1)$
- , and meets one axis in the point
- $x=2$
- , and the other in the point
- $y=3$
- ; find where it meets again the axes which are supposed to be rectangular.

6. Given
- $\sin \alpha = \mu \sin \beta$
- ,
- $(n+1) \cos \alpha = \mu \cos \beta$
- , find
- $\cos \alpha$
- .

DR. SHAW.

7. Given
- $P\rho + (1-P) = P'\rho' + (1-P') = P''\rho'' + (1-P'')$
- , prove that

$$\frac{\rho - \rho'}{P''} + \frac{\rho' - \rho''}{P} + \frac{\rho'' - \rho}{P'} = 0.$$

8. A messenger starts with an errand at the rate of
- $3\frac{2}{3}$
- miles an hour; another is sent half an hour afterwards to overtake him, which he does in two hours; at what rate did he ride? Find also in what time he will do it, if he rides 12 miles an hour.

9. One of the diagonals of a given quadrilateral is bisected by the other; prove from the equations of the lines that if the opposite sides of the quadrilateral be produced to meet, and the points of intersection joined, the joining line is parallel to the bisected diagonal.

10. The base angles of a right-angled triangle are joined by right lines to the opposite corners of the squares described on the sides; show from

the equations of the joining lines that they meet on the perpendicular of the triangle.

11. If the sines of the angles of a triangle be in arithmetical progression, so are the cotangents of the half angles also?

12. The sides of a plane triangle are 3, 5, 6; compare the radii of the inscribed and circumscribed circles.

MR. WILLIAMSON.

13. Find the co-ordinates of the vertices, and the area of a triangle, the equations of whose sides are

$$4x + y = 11, \quad 2x - 3y = 23, \quad \text{and} \quad 6x + 5y = 27.$$

14. Find the equation of the pair of tangents from the origin to the circle,

$$x^2 + y^2 + 2x - 4y = 16.$$

15. Resolve into its partial fractions the expression

$$\frac{x+1}{2x^3-5x^2-3x}.$$

16. In a plane triangle, prove

$$\cot \phi = \frac{a^2 - b^2}{2ab \sin C},$$

where ϕ is the angle the bisector of the base makes with the base.

17. Show that

$$\sin 3A \sin^3 A + \cos 3A \cos^3 A = \cos^3 2A.$$

18. One of the roots of the equation

$$x^4 + 4x^3 + 3x^2 - 2x - 6 = 0$$

is $-1 + \sqrt{-1}$; find all the roots.

C.

DR. SALMON.

1. Find the value of the square root of 343 divided by the fifth root of 0.027.

2. In how many years will a sum of money double itself at 4 per cent. compound interest, payable half-yearly?

3. Find x from the equation $2^x + 2^{x-1} = 10$.

4. Find the area of a quadrilateral inscribed in a circle whose sides are 521, 348, 419, 623.

DR. SHAW.

5. Two variable right lines pass respectively through the two points 3, 4; -2, 7, and intersect at $\tan^{-1} 5.4$; determine the radius and centre of the circle which is the locus of their intersection.

6. Find the coefficient of x^5 in the expansion $(2 - 5x - 7x^2)^3$.

7. If in a triangle, $3c = 7b$, and $A = 6^\circ 37' 24''$, find the other angles.

8. Apply Horner's method to find the positive root to four places of decimals, lying between 5 and 6, of the equation

$$x^3 + 2x^2 - 23x - 70 = 0.$$

MR. WILLIAMSON.

9. Find expressions for $\sin 15^\circ$ and $\tan 15^\circ$, and calculate *either* of them to 5 decimal places.

10. Apply the method of divisors to find a root of the equation

$$3x^4 - 17x^3 + 41x^2 - 59x + 40 = 0.$$

11. The sides of a triangle are 2357, 4312, 3675; find its greatest angle.

12. Find the value of the symmetric function $\Sigma a^2 b^3$ of the roots of the equation

$$x^4 + 7x^3 - 9x^2 + 12 = 0.$$

Classics.

HERODOTUS.

MR. GRAY.

Translate the following passages into English :—

1. *Beginning*, Δεῖ δὴ με πρὸς τοῦτοισι ἔτι φράσαι, κ. τ. λ.
Ending, καὶ σταθμοὶ τε καὶ ὑπέρθυρα ὡσαύτως.

Lib. i. c. 179.

2. *Beginning*, Ἐμοὶ δοκεῖ, ἓνα μὲν ἡμέων μούναρχον, κ. τ. λ.
Ending, ἐν γὰρ τῷ πολλῷ ἐνὶ τὰ πάντα.

Lib. iii. c. 80.

3. *Beginning*, Ταύτης ὣν οἱ Σκύθαι τῆς καννάβιος, κ. τ. λ.
Ending, καταπλαστὸν γίνονται καθαραὶ καὶ λαμπραὶ.

Lib. iv. c. 75.

4. *Beginning*, Παρίοισι μὲν δὴ ταῦτα ἡ Πυθίη ἔχρησε, κ. τ. λ.
Ending, τὰ δὲ πεντήκοντα τάλαντα ἐξέτισε ὁ παῖς αὐτοῦ Κίμων.

Lib. vi. c. 136.

1. Describe the reforms introduced by Cleisthenes. What precaution did he take to prevent any tribe forming itself into a political faction?

2. Give a short history of each of the Greek colonies in Italy. To what causes is their decline in power to be attributed?

3. What war is alluded to by Herodotus in the words, οὗτος ὁ πόλεμος συστάς ἔσωσε τότε τὴν Ἑλλάδα; and what circumstances led to it?

4. Describe accurately the state of Asia before the rise of the Persian monarchy.

5. Mention, in order, the principal towns and rivers which were passed by Xerxes on his march from Sardis to Greece.

6. Give an account of the physical and political geography of Asia Minor.

7. What are the principal peculiarities of the Ionic dialect in the case of (1) verbs in $\mu\iota$, (2) barytone verbs, and (3) contracted verbs?

8. The Ionians adopt contraction in certain cases where the Attic writers reject it?

9. In what cases does Herodotus omit the augment?

10. What is the difference between the imperfect tense and aorist in the narration of past events; and what is the effect produced by their being interchanged and contrasted in the same passage?

11. What were the sources from which Herodotus compiled his history?

12. Describe the battle of Marathon.

LIVY.

MR. FERRAR.

Translate the following passages into English :—

1. *Beginning*, Dum consul placandis Romæ diis trahendoque
Ending, et quia medendi nec locus nec tempus erat, altero oculo capitur.
 Lib. xxii. c. 2.

2. *Beginning*, Adversus hunc navalem apparatus Archimedes
Ending, arcere terra marique commeatibus hostem, placuit.
 Lib. xxiv. c. 34.

3. *Beginning*, Tum Virginius, Oratio, inquit, rebus dubiis inventa est.
Ending, quum causæ dicendæ data facultas sit, tum se experturum.
 Lib. iii. c. 56.

4. *Beginning*, Ad hæc consultanda procurandaque, ...
Ending, tum temperata et belli et pacis artibus, erat civitas.
 Lib. i. c. 22.

1. Give a brief account of the origin and rise of Syracuse.

2. In what struggles were the Romans engaged between the first and second Punic wars?

3. Trace Hannibal's route from Spain into Italy.

4. Draw a plan of the battle field at Cannæ, and point out the exact disposition of the opposing armies.

5. What was the Constitution of Carthage?

6. Describe the origin of the offices of the Dictator and Censor, the mode in which they were elected, and the extent and limitations of their powers.

7. Name the chief Romans who fell in battle during the second Punic war.
8. Draw a map of Sicily, and give both the ancient and modern names of each place.
9. What were the chief rivers of Spain?
10. When do relative propositions stand in the conjunctive mood?
11. How are questions expressed in the *oratio obliqua*?
12. When may a preposition be separated from its case?
13. Explain the formation of the perfects *cessi, vexi, ussi, pegi, sevi*, and of the presents *sero, cerno, facio, gigno*.
14. What were the original forms of the person-endings of the Latin verb? Identify these with the corresponding Greek terminations.
15. What historical fact do the forms of the words Carthago, Afri, and Sarranus teach us?
16. What is the origin of the name *Iberi*?
17. What traces are there of Phœnician settlements on the continent of Italy?
18. Explain the formation of the words *Diana, regina, Pontius, Petreius*, and *quantus*.
19. How does Merivale account for Livy's failure as an historian?
20. Give a brief sketch of the life of Livy. What indications are there that the earlier portions of his history were published before the later?

MR. ABBOTT.

Translate the following passage into Greek Prose:—

Beginning, This profound author, among many mystical passages, ...
Ending, and may be looked upon as a dark constellation.

Spectator, No. 582.

Translate the following passage into Greek Verse:—

Beginning, Go, bear Patroclus' body to Achilles;
Ending, That proof is call'd impossibility.

SHAKSPEARE, *Troilus and Cressida*, act v. sc. 5.

Translate the following passage into Latin Prose:—

Beginning, Every one knows how well Voltaire

Ending, the one may be a consequence, not a contradiction, of the other.
BULWER, *The Student*.

Translate the following passage into Latin Hexameters:—

Beginning, *Men*. There was a time, when all the body's members, ...
Ending, They are not such as you.

SHAKSPEARE, *Coriolanus*, act i. sc. 1.

EXAMINATION FOR LICENSES IN ENGINEERING.

MR. M. ROBERTS.

1. A wall of brickwork (weighing 112 lbs. per cubic foot) sustains a pressure of 1115 lbs., which is applied by means of a bracket at a horizontal distance of 2 ft. 6 in. from the inner edge of the wall; the pressure is inclined to the horizon at an angle of 65° , and is such as just not to overthrow the wall. Find the height of the wall.

2. The elongation of a steel bar 35 ft. long, when subjected to a strain of 50 tons, is 0.02 ft.; determine in square inches the transverse section of the bar. [The modulus of elasticity is 29,000,000.]

3. A mass of earth weighing 100 lbs. per cubic foot, whose surface is horizontal, presses against a wall of brickwork whose section is rectangular, and the top of the wall is on a level with the ground. If the natural slope of the earth is 30° , and if the thickness of the wall to enable it to sustain the pressure of the earth is 9.82 ft.; find the height of the wall.

4. A river wall of granite weighing 164 lbs. per cubic foot, whose section is a right-angled triangle, and whose hypotenuse is turned towards the water, just supports the pressure of the water when its surface is on a level with the wall. If the height of the wall is 29 ft. 6 in., find the thickness of its base.

5. A stone wall 30 ft. high and 2 ft. thick has to sustain on each foot of its length a thrust equal to the weight of 3 cubic feet of stone, acting in a direction inclined to the vertical at an angle of 45° . If the pressure is applied at the point of a bracket whose distance from the wall is 7.04 ft., find the distance from the extrados of the point in which the line of resistance cuts the base.

6. Two rafters AB, AC, are each 24 ft. long, and their feet are tied by a wrought iron rod which has a section of $\frac{5}{8}$ ths of a square inch. If a weight of 56,000 lbs. suspended from A just breaks the tie, find its length. [The tenacity of wrought iron is 67,000 lbs. per square inch.]

7. If the least pressure that will draw a cubic foot of cast iron down an inclined plane of oak is 146.7 lbs., find the inclination of the plane. [The limiting angle of resistance of cast iron or oak is 33° .]

8. If a line AB is subjected to a continuous pressure throughout its length such that the pressure at any point P is at the rate of $k \times AP$ per unit of length, find the amount of the resultant pressure, and its moment round A.

THEORY OF THE STEAM-ENGINE.

MR. GALBRAITH.

1. Adopting the formulæ used by the French Commissioners, as

adapted to pounds' pressure on the square inch and the Fahrenheit scale, viz.,

$$P = \left(\frac{t + 40}{147} \right)^5,$$

and

$$t = 147 \sqrt[5]{P - 40};$$

find the relative volumes of steam corresponding to the pressures, 20 lbs. and 80 lbs. on the square inch, by means of the formula

$$\text{Rel. vol.} = 37 \frac{460 + t}{P}.$$

2. Compare these results with those which follow from the empirical formula which gives the relative volume in terms of the pressure only, viz.,

$$\text{Rel. vol.} = \frac{C}{P + \gamma}.$$

3. Prove that the work done, due to the evaporation of one cubic inch of water, at a temperature t , is expressed as follows:

$$\text{Work done} = 3\frac{1}{2} (460 + t).$$

4. Let the temperature of the condenser be 96° , and of the cold water jet 56° , how much water will be required to condense 1 lb. of steam of the standard pressure?

5. If the law of Boyle and Mariotte be assumed, prove that the work done, after the steam is cut off, is measured by the Napierian logarithm of the expansion.

6. If P' be the pressure in the cylinder before the steam is cut off, prove the following formula for the horse-power:

$$\text{H. P.} = \frac{42 av}{11000} \left\{ \frac{k}{e} (P' + \gamma) - (p + f + \gamma) \right\}.$$

7. Apply this formula to the case of a condensing engine, in which the diameter of the cylinder is 48 inches, the stroke 8 feet, the number of revolutions 16, the expansion $\frac{3}{8}$ ths, and the pressure of steam before the cut off 24 lbs.

8. Let the diameter of the cylinder be 54 in., length of stroke 4 ft. 4 in., number of revolutions 21, evaporation 3 cub. ft. per minute, and steam cut off at $\frac{3}{4}$ ths; required the pressure of the steam before expansion takes place.

APPLIED GEOLOGY.

PROFESSOR HAUGHTON.

1. The percolating power of lower green sandstone beds was found by experiment to be 18 cub. in. per hour, through 15 in. of sand, in a bent pipe of $1\frac{1}{4}$ in. diameter, under a pressure of 6 in. of water. Required the area of filter beds that, under 6 in. of water, would discharge as much water as a $1\frac{1}{4}$ in. pipe running free.

2. Find the height of a column of water that would force as much water through the sand as would run through the pipe under a 6 in. head.

3. The drainage area of the Mississippi is 1,244,000 sq. m., and its mean annual rain-fall is 30.4 in.; its annual discharge into the Gulf of Mexico is 21,300000,000000 cub. ft. What is the proportion of the rain-fall expended in evaporation and vegetation?

4. The length of the Missouri River, from Madison Fork to the Gulf of Mexico is 4194 miles; and the height of Madison Fork above the sea level is 6800 ft. Supposing the water that leaves Madison Fork to reach the Gulf with a velocity of $1\frac{1}{4}$ mile per hour, what is the proportion of its work expended on the road?

5. Describe the physical and blowpipe characters of the oxides of iron usually employed as ores?

6. What are the blowpipe characters of copper glance and copper pyrites?

7. How do you distinguish between wolfram and tinstone by means of the blowpipe?

8. A shaft is sunk on a lode to a certain distance, when the lode is found to be separated, and thrown down by a slide; the lode is afterwards recovered by rising on the slide, and again worked. Find the total depth of the working, and the horizontal distance at which a down-right shaft should be sunk to reach the end.

	Draft.	Underlay.
1st part of lode, . . .	+ 114 ft.	+ 54° 30'
Slide, ...	- 32 "	- 43 "
2nd part of lode, . . .	+ 73 "	+ 51 "

9. An oblique shaft was found to measure 89 ft. 6 in. on an angle of $55^{\circ} 15'$; and it was also observed that the shaft had declined $3^{\circ} 45'$ west from the intended right angle of the east and west lode. Find the amount of error in the bottom of the shaft, and the perpendicular depth of the mine.

10. Two lodes intersect, having the following bearings and underlays:—

No. 1.	E. 5° N.	. .	64° N.
No. 2.	N. W.	. .	42° W.

Find the bearing and underlay of their intersection.

DR. DOWNING.

1. The centre lines of a railway meet at an angle of 140° , and it is intended to connect them by a curve of 18 chains radius. Calculate in feet and decimals of a foot—

- The tangent lengths from the springing point.
- The secant point.
- The length of the arc of the curve.

2. Proceeding to set out the curve by the method of offsets from the springing point, compute the first and the succeeding offsets in No. 1.

2 a 2

3. The centre lines of a railway being found to meet in the middle of a deep river, a line, 530 links long, is measured along the bank from a point A on one line to a point B on the other, the angle at A between B and a ranging rod set up some distance back on line A being 144° , and that at B between A and a ranging rod back on line B being 142° . Calculate—

a. The angle of intersection of the two straight lines.

b. The tangent lengths measured from the points A and B, and the secant point; the radius of the curve being 26 chains.

4. In question No. 3 compute the lengths of both rails of the up line, and same of the down line, for that curved portion of the line; the middle space being 6 ft., and the gauge used being the Irish.

5. An engine weighing 29 tons, travels on a curve of 40 chains radius at a rate of 30 miles per hour. Calculate the centrifugal force in tons and in feet per second.

6. The main tubes of the Britannia Bridge have a clear span of 460 ft., and a weight of 1553 tons (which may be taken as uniformly diffused); the depth at middle of span, from centre to centre of cells, 27 ft. 6 in., and the area of metal in the bottom cells 585 sq. in. Compute the strain per square inch in tons on the bottom. And assuming 18.6 tons per square inch as the ultimate resistance to tension of the iron used, calculate the central load the tube would sustain before breaking. The principle of the bent lever, as in the Text Book, is to be employed in the computation.

8. Draw up a statement of all that is given in the "Specifications," in the several different works, as to the payments to contractors.

9. Write out fully and clearly the specification of any two of the retaining walls in the Text Book.

10. Give the specification for main and thorough drainage, with the detail of the depth, distance apart, and length of the drains; and a detailed estimate per acre.

11. Calculate the number of cubic feet delivered over a weir—

Length on crest, 55 feet.

Depth of water on do., 5 inches.

12. To what height must a sluice, 4 ft. wide in the clear, be opened to reduce the depth of water flowing over the weir in No. 11, by 2 in.; the depth from the cill of the sluice to the surface of the water being 7 ft., and its coefficient of contraction taken equal to 0.84.

13. Compute the diameter of two equal pipes to convey the same volume of water as would be brought down by one main 33 in. diameter; the fall in each case being 8 ft. per mile.

14. Calculate the discharge of a channel having a bottom width of 12 ft., the width at the water surface being 20 ft., and depth of water 3 ft.; and point out the peculiarity of a channel having such side slopes. Fall, 4 ft. per mile.

15. Give a succinct statement of the Ganges Canal from that contained in the "Practical Hydraulics."

16. Calculate the number of cube yards in the excavation, with the dimensions following:—Lengths from A to B, 180 ft.; from B to C, 290 ft.; and from C to D, 310 ft.; the heights being—at A = 0 ft., at B = 24 ft., at C = 33 ft., at D = 0 ft.; the slopes being 2 to 1, and base 30 ft. The contents of each separate block must be brought out in cubic yards.

17. In a wrought iron flanged girder, having equal flanges at top and bottom, let a be the sectional area of either the top or bottom, and a' that of the vertical rib, the depth from centre to centre of flanges being d . Prove that

$$I = \frac{d^3}{12} (6a + a');$$

and show the application of this to the computation of the moment of the elastic forces of the transverse section of the beam.

18. Compute the difference of the deflection of a beam under a uniform load, and the same load applied at the centre.

19. The breaking weight of a hollow cast iron column being given in tons by the formula,

$$42.35 \frac{d^{3.5} - d_1^{3.5}}{l^{1.5}} = \text{Breaking weight in tons,}$$

in which d the external and d_1 the internal diameters are in inches, and l the length in feet; calculate the ultimate strength of a column 26 ft. high, and having 13 in. external and 10 $\frac{3}{4}$ in. internal diameter.

20. Calculate the diameter of a solid pillar having the same quantity of metal and same height as in last question, and its ultimate strength.

21. Describe and sketch the method of making the hydraulic press work water-tight, and calculate the diameter of the ram so that at 3 tons to the square inch of pressure it may lift 1000 tons.

22. Give the investigation for the general expression for the strain on a diagonal bar at any given position in the span of a lattice girder, when the weight is applied at the centre of the span.

23. Give the investigation for the strain as in last question, when the load is uniformly applied.

24. It is required to cross a river by a wrought iron girder bridge; the clear span between the abutments being 86 ft., and having to carry a single line of railway on the narrow gauge. Draw out a figured sketch of the transverse section and elevation, consistent with the usual dimensions, and such as will pass the inspecting officer; the sides or vertical webs being boiler plate, not lattice work.

25. Design a cast iron girder for a span of 22 ft., consistent with the usual proportions, and of such strength as will sustain with perfect safety a load equivalent to a weight of 14 tons applied at the centre. Write out clearly the formula by which you work, and deduce it from the experiments on which it is based.

26. Give a statement of the design and construction of the Bow Bridge, with its chief dimensions, centring, and coffer dam.

27. State the peculiarities of the tidal action in the Ballyteigue lough prior to its reclamation, and the consequences of the construction of the

embankment between it and the sea. Give the details of the construction of the self-acting sluices, noting the advantages derived therefrom.

28. Describe the Fen district of the east of England, and the character of the rivers flowing through it; and give in detail an account of the remedial works of the Nene outfall and Eau brink cut.

29. State fully, and prove the truth of Mr. Galbraith's rule for the number of gallons per 24 hours delivered from a rain basin of a given number of square miles' area, and having a known annual rain-fall.

30. Explain by a sketch what is meant by the "Average Lead" (Day on the construction of Railways); and show also the most and the least advantageous form of longitudinal section of excavation and embankment with reference to this point.

31. Calculate the inclination of a coal tramway so that the work of the horses may be equal in ascending and descending; each waggon carrying 1 ton of coal in descending, and 2 cwt. of stores, &c., in ascending, and weighing unloaded 6 cwt.; the friction being $\frac{1}{10}$ th part of the load.

CHEMISTRY AND MINERALOGY.

DR. APJOHN.

1. How would you make the analysis of a gaseous mixture, including oxygen, nitrogen, carbonic acid, and muriatic acid?

2. Give the theory of the production of chlorine from pyrolusite, and from bichromate of potash.

3. Write the formula of ferrocyanide of potassium; and enumerate and explain the products obtained when it is distilled with dilute sulphuric acid.

4. Enumerate the leading minerals which include phosphoric acid. Write the formula of the native phosphate of lime, and explain the mode of making its analysis.

5. The sulphide of hydrogen in a mineral water may be estimated either volumetrically, or by precipitation. Explain each of these processes.

6. Write the formula of the Prussian gunpowder, and enumerate the products of its combustion.

7. Common iron pyrites, like mispickel, contains sulphur, iron, and arsenic; how, then, are these minerals distinguished from each other?

8. Enumerate the metallic ores which include carbonic acid, and write the formula and crystalline system of each.

9. Bromide of potassium sometimes contains iodide of same metal; how is the latter best detected?

10. A mixture of copper pyrites with an ore of iron gave, upon analysis, the following results:—

		Atomic weights.
Sulphur, ...	35.08	16
Copper, ...	29.31	31.75
Iron, ...	35.54	28

How was the analysis made?—what is the ore of iron?—and what the atomic proportion in which the two minerals are mixed?

11. How would you make a complete analysis of a limestone, including, besides carbonate of lime, the carbonates of magnesia, iron, and manganese; and argil, the alumina of which is partly soluble?

12. Explain how, by chemical means, you would estimate the value of a hydraulic lime.

13. Give Rose's notation of a closed and an open form in the second, third, fourth, fifth, and sixth crystalline systems.

14. How would you deprive the oil of vitriol of commerce of its arsenious acid, its nitrous acid, and its saline matter?

15. Enumerate the bases and acids usually present in ordinary well water occurring in a limestone district; specify the mode of estimating each; and explain what circumstance connected with the analysis would lead you to suspect the presence of nitrates. Lastly, give the direct test usually employed for nitric acid occurring in water.

ENGINEERING EXAMINATION.

MIDDLE CLASS.

SUPPLEMENTAL EXAMINATION.—PRACTICAL MECHANICS.

MR. TOWNSEND.

1. A ton weight rests on a rough inclined plane, whose height and length are 21 and 100 feet, respectively; required the least coefficient of friction that will be just sufficient to prevent motion.

2. In the same case, the friction being just sufficient to prevent motion, what constant force should be applied parallel to the plane so as to make the weight fall through its entire length in one minute?

3. Each rafter of an ordinary isosceles roof sustains a weight of 256 lbs.; if the pitch of the roof be 36° , required the horizontal thrust of each rafter against the sustaining wall.

4. In the same case, if the wall be of brickwork of 112 lbs. weight per cubic foot, and of any height; required its limiting thickness to sustain the pressure, the rafters being supposed to be 2 ft. apart.

5. A coffer-dam sustaining a pressure of 26 ft. of water is supported by props 20 ft. long, 20 ft. apart, and applied along the line of pressure of the water; required the thrust on each prop.

6. A raft 30 yds. long, 20 yds. broad, and 16 in. deep, is made of wood whose specific gravity = 0.6; required the greatest load it will just sustain without sinking below the surface of water.

7. The extremities of the supporting chains of a suspension bridge are inclined 20° to the horizon; if the tension at the middle point of each be 100 tons, required the tensions at its extremities.

8. Show that the strength of a rectangular beam to resist fracture at a given point, under a given moment, varies as the product of its breadth into the square of its depth at the point.

LLOYD EXHIBITION EXAMINATION.

PROFESSOR JELLETT.

1. A heavy particle is allowed to descend along a rectilinear groove laid on a smooth inclined plane; what is the pressure on the side of the groove?

2. If at any point an opening be cut in the side of the groove, determine completely the motion of the particle after it reaches this point.

3. A particle resting on a rough inclined plane is attached by a fine string to a fixed point in the plane; if the particle be disturbed from its position of equilibrium, determine the angle through which it must be moved in order that it may just return to its original position.

[N. B.—The original position of equilibrium is supposed to be that which it would be if the plane were smooth.]

4. A rectangular block is laid on the less steep of two smooth inclined planes which slope in the same direction; one of the edges of the block being coincident with the line of intersection of the planes. The block is sustained by a cord passing over a given pulley, and supporting a weight. Find the condition of equilibrium.

5. A right cone is placed on its base on a rough inclined plane, the inclination of which is gradually increased. Find the condition that motions of rolling and sliding may take place simultaneously.

6. An ellipse is placed with its major axis vertical; to find the radius vector by which a particle will descend in the shortest time from the upper focus to the curve.

MR. M. ROBERTS.

1. If α, β, γ are the direction angles of a right line in reference to three rectangular axes, find the value of the determinant

$$\begin{vmatrix} \tan^2 \alpha, & -1, & -1 \\ -1, & \tan^2 \beta, & -1 \\ -1, & -1, & \tan^2 \gamma \end{vmatrix}$$

2. Find the condition that the equations

$$\begin{aligned} ax^3 + 3bx^2 + 3cx + d &= 0, \\ (ac - b^2)x^2 + (ad - bc)x + bd - c^2 &= 0, \end{aligned}$$

should have a common root.

3. Prove that the sum of the p^{th} powers of the roots of the equation

$$x^n + p_1 x^{n-1} + p_2 x^{n-2} + \dots = 0$$

is the coefficient of m^p in the expansion by powers of m of

$$\frac{n + (n-1)p_1 m + (n-2)p_2 m^2 + \dots + p_{n-1} m^{n-1}}{1 + p_1 m + p_2 m^2 + \dots + p_n m^n}.$$

4. If $a + b + c = 0$, express $ab + ac + bc$ and abc by means of the quantities $a - b, a - c, b - c$.

5. Prove that the two series

$$\frac{1}{(1-x)^2} + \frac{x}{(1-x^2)^2} + \frac{x^2}{(1-x^3)^2} + \dots$$

$$\frac{1}{1-x} + \frac{2x}{1-x^2} + \frac{3x^2}{1-x^3} + \dots$$

are identical.

6. Let $R = \sqrt{a + \beta x^3 + \gamma x^4}$, if

$$x^{2m-3} R = A \int \frac{x^{2m-4} dx}{R} + B \int \frac{x^{2m-2} dx}{R} + C \int \frac{x^{2m} dx}{R},$$

find the values of A , B , C .

7. Find the condition that the ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

and the circle

$$(x - \alpha)^2 + (y - \beta)^2 = k^2$$

should touch each other.

8. A perpendicular is dropped from the centre of an ellipse on any tangent to the curve; show that two circles may be found such that the rectangle under the tangents drawn to them from the foot of the perpendicular is constant.

ASTRONOMY AND OPTICS.

MR. TOWNSEND.

1. Explain the method of determining the latitude of a place from an observed zenith distance of a known heavenly body taken very near the meridian of the place.

2. Explain the method of determining the longitude of a place, supposed approximately known, from the observed occultation of a known star by the Moon.

3. When the latitude and time are determined from two altitudes of the Sun and the interval between, required the corrections to be applied for given small errors in the altitudes.

4. For a given day and place, express the difference between the lengths of morning and evening in terms of the Sun's change in declination from his rising to his setting.

5. Investigate the formulæ for the effects of aberration on the right ascension and declination of a known star; and show from them the positions of those stars for which the effects vanish.

6. The Earth being supposed very nearly spherical, express the lengths of its equatoreal and polar radii in terms of the lengths of any two measured arcs of meridians whose terminal latitudes are known.

7. Investigate the differential equation of the course of a ray of light through a medium composed of spherical strata varying according to any

law; the incidence being supposed to take place in a plane passing through their common centre.

8. Explain the most accurate method with which you are acquainted of determining the refractive index and dispersive power of a given transparent substance.

9. Investigate the formula for the angular semidiameter of a halo on the hypothesis of its formation by refraction through prisms of ice placed in their positions of minimum deviation.

10. The eye of an observer being situated in a plane passing through a luminous point, and the common axis of a system of thin lenses; exhibit by a figure the course of the pencil by which the point is seen by the observer.

M'CULLAGH PRIZE EXAMINATION.

CALCULUS OF VARIATIONS.

PROFESSOR JELLETT.

1. If

$$U = \int_{x_0}^{x_1} V dx,$$

where

$$V = f\left(x, y, \frac{dy}{dx}, \dots, \frac{d^ny}{dx^n}\right);$$

and if, moreover, the limiting values of

$$x, y, \frac{dy}{dx}, \dots, \frac{d^ny}{dx^n}$$

be given, show that $\delta^2 U$ may be put under the form

$$\delta^2 U = \int_{x_0}^{x_1} \left\{ A_0 \delta y^2 + A_1 \left(\frac{d\delta y}{dx} \right)^2 + \&c. + A_n \left(\frac{d^n \delta y}{dx^n} \right)^2 \right\} dx.$$

2. If

$$U = \iint V dx dy,$$

where

$$V = A(rt - s^2) + Br + Cs + Dt + E,$$

$A, B, \&c.$, being functions of x, y, z, p, q , show that $\delta^2 U$ may be put under the form

$$\delta^2 U = \iint \Omega dx dy,$$

where Ω is a homogeneous quadratic function of $\delta x, \delta p, \delta q$.

N. B.—The limiting values of x, y, z , and p or q , are supposed to be given.

3. In determining, by the method of the Calculus of Variations, the surface of given superficial area which makes

$$\iint \left(\frac{1}{R} + \frac{1}{R'} \right) dS$$

a maximum or minimum, show that we find as the equation of the surface

$$R + R' = \text{const.},$$

R, R' being the principal radii of curvature.

a. Prove that, if the surface be closed,

$$\iint (R - R')^2 \sin \theta d\theta d\phi = 0,$$

and hence infer that if $rt - s^2$ be finite throughout the surface, it must be a sphere.

N. B.— θ, ϕ , are the polar angles which determine the position of the normal.

4. The equation of an attracting surface of given superficial area, whose potential with regard to a given point is a maximum, is

$$\frac{1}{R} + \frac{1}{R'} = \frac{P}{r} \frac{\phi r}{\phi_1(r) + a},$$

P being the perpendicular on the tangent plane, r the radius vector from the attracted point, ϕr the law of the attraction, and

$$\phi_1(r) = \int \phi r dr.$$

5. Give a sketch of the progress of the Calculus of Variations, pointing out the principal contributions of the brothers Bernoulli, Euler, Lagrange, Jacobi, and Sarrus.

MR. LESLIE.

1. The order of the equation $\beta = 0$, furnished by the Calculus of Variations for the determination of the function which renders $\int V dx$ a maximum, may be depressed—(a) if V does not contain the independent variable; (b) if m of the quantities $y, y', \&c.$, be wanting. In the latter case, find when the solution is determinate.

$$V = f(x, y, y' \dots y^{(n)}), \quad y' = \frac{dy}{dx}, \quad \&c.$$

2. If the solution of the differential equation

$$f(x, y, y' \dots y^{(n)}) = 0$$

be given, prove that the complete integral of the linear equation

$$z \frac{df}{dy} + z' \frac{df}{dy'} + \&c. + z^{(n)} \frac{df}{dy^{(n)}} = 0$$

is also given. Hence the solution of $\delta\beta = 0$ can be deduced from that of $\beta = 0$.

3. Prove that $\delta\beta = 0$ may be written in the form

$$u_1 Du_2 D \dots u_n D A D u_n \dots Du_2 Du_1 \delta y = 0, \quad D = \frac{d}{dx},$$

and hence show that

$$\delta^2 \int V dx = \int \frac{d^2 V}{dy^{(n)2}} \left[\frac{Du_n Du_{n-1} \dots Du_1 \delta y}{u_n u_{n-1} \dots u_1} \right]^2 dx.$$

4. Show how to calculate $u_1, u_2, \&c.$, in terms of the particular solutions of $\delta\beta = 0$, and hence prove that

$$\delta^2 \int V dx = \int \frac{d^2 V}{dy^{(n)2}} \frac{\Delta^2}{\Delta'^2} dx,$$

2 b

$$\text{where } \Delta = \begin{vmatrix} u & v & w & \dots & \delta y \\ u' & v' & w' & \dots & \delta y' \\ \dots & \dots & \dots & \dots & \dots \\ u^{(n)} & v^{(n)} & w^{(n)} & \dots & \delta y^{(n)} \end{vmatrix} \quad \Delta' = \begin{vmatrix} u & v & w & \dots & \\ u' & v' & w' & \dots & \\ \dots & \dots & \dots & \dots & \\ u^{(n-1)} & v^{(n-1)} & w^{(n-1)} & \dots & \end{vmatrix}$$

$u, v, w \dots$ being n different solutions of $\delta\beta = 0$.

5. If a curve joining two points be such that the surface generated by its revolution about a given line may be a minimum, prove that it is a catenary; and determine the limits within which the solution of the question is possible.

6. Prove that the conditions requisite for a minimum, in the last question, cannot be satisfied, unless the point of intersection of the tangents drawn to the curve at the extreme points lie between the curve and the given line.

7. Prove that a sphere is the only closed surface of revolution which includes a maximum solid under a given surface.

(a). If the surface be not closed, discuss the nature of the generating curve.

8. Find a curve such that the area bounded by the curve, its extreme radii of curvature, and the arc of the evolute between them, may be a minimum.

(a). Show that, if the extreme points be given, its equation can be reduced to the form

$$\frac{dy}{dx} = \sqrt{\frac{a-y}{y}}.$$

EXAMINATION FOR THE DEGREE OF BACHELOR IN MEDICINE.

DR. BANKS.

1. What are the forms of delirium which may occur in typhus fever?
2. How is the delirium tremens of typhus distinguished from that of the drunkard?
3. Give the characters which distinguish inflammation of the brain and its membranes from typhus fever.
4. What are the distinctions between pneumonia and hypostatic consolidation of the lung in typhus?
5. Contrast the mental states in typhus and typhoid fever.
6. Describe the alvine dejections in typhoid fever.
7. What are the symptoms of acute renal dropsy?
8. How would you treat the disease?

9. What are the characters of the pulse in fatty degeneration of the heart?

10. How would you treat the disease? and what are the remedial agents which may prove dangerous?

ANATOMY AND PHYSIOLOGY.

PROFESSOR M'DOWEL.

1. What parts constitute the mesocephalon?

2. Describe the septem lucidum, and the mode of its formation.

3. What effects would you expect to follow an interruption of nervous influence in one of the nerves of the third pair?

4. Describe the crystalline lens. What advantages follow from its not being of uniform density? Compare its form in the young and in the old.

5. Enumerate the parts contained in the parotid gland, and give their relative positions.

6. Enumerate in order the tributaries of the inferior vena cava.

7. What are kreatine and kreatinine?

8. The microscopic characters of cartilage, and of white and yellow fibrous tissue?

9. Describe a Pacinian corpuscle.

10. Mention any osteological conditions characteristic of the mammalia.

MATERIA MEDICA.

DR. OSBORNE.

1. The difference between oil of turpentine and the other volatile oils?

2. Why are the observations made on the medical properties of plants in the writings of Theophrastus, Dioscorides, and other ancient authors, for the most part of no value at the present time?—and, on the contrary, how is the value of modern observations secured for the future?

3. What inconvenience might result from the following prescription?—

℞	Carb. Magnes. ʒi.	
	Sulphuris loti.	
	Bitart. potass. utriusque, ʒiiss.	
	Conserv. Rosar. q. s.	M.
	Ft. Electuarium.	

4. How is the presence of arsenic in sulphuric acid ascertained?

5. The difference between the effects of brandy and whiskey are well known and recognised; how explained?

6. It having been resolved on to use tobacco in a case of obstructed bowels in an adult, write a prescription in full to carry this resolution into effect.

7. What facts tend to prove that chlorine, although a deodorizer, yet is not a disinfectant?
8. All vegetable acids passing through the kidneys are changed into carbonic acid, with a few exceptions. What are the exceptions?
9. Arrange the salts of the alkalies and alkaline earths used in medicine in the order of their solubility in water, prefixing a mark on those soluble in alcohol.
10. The test, antidote, and dose of sulphuric acid?

CHEMISTRY.

DR. APJOHN.

1. In the manufacture of nitrate of silver, fine silver should be used; how is it obtained?
2. How is ferri sulphus granulatum made, and why does its solution become black on adding to it a single drop of nitric acid, and lose its black colour with effervescence on adding an excess of the acid?
3. Metallic iron may be at once converted into sesquichloride by aqua regia; what is the reaction which conducts to such a result?
4. Assuming atmospheric air to consist of nitrogen, oxygen, carbonic acid, and aqueous vapour, how would you determine the amount of each of these constituents?
5. Enumerate the chlorides mentioned in the Pharmacopœia; write the formula of each; and indicate the process by which it is made.
6. Sulphate of quina may contain sulphate of cinchona, starch, sugar, salicine, or crystallized sulphate of lime; how would you detect these different impurities?
7. What solvent would you employ for the purpose of extracting strychnia from the contents of the stomach; and how would you prepare the residue left on evaporation for the application of the colour test?
8. Write the formula for ferrocyanide of potassium; enumerate the products which are formed when it is distilled with dilute sulphuric acid; and explain the reaction which it exerts on a persalt of iron.
9. What is *Trommer's test*, and to what purpose in animal chemistry is it applied?
10. What is the rule for knowing the direction of the electric current in a voltaic machine, and what are the methods in use for measuring its intensity?

BOTANY.

DR. HARVEY.

1. Describe the origin, usual structure, and appearance of wood-tissue; and the changes that take place in it as it advances to maturity.
2. Describe the processes of absorption, digestion, and assimilation, in plants.

3. Give examples of plants with *valvate*, *induplicate*, and *contorted* aestivation of sepals or petals, or both.
4. Define the terms, *raphe*, *chalaza*, *micropyle*, *primine*, and *secundine*, as applied to ovule or seed.
5. Explain the inflorescence of *Euphorbia*.
6. Name and give the natural orders of the plants producing Tamarinds and Jujubes.
7. Distinguish *Solanaceæ*, on the one hand, from *Convolvulaceæ*, and on the other from *Scrophulariaceæ*.
8. How are *Loganiaceæ* known from *Cinechonaceæ*?
9. Name and describe in correct botanical terms the plant marked No. 1,—giving the several characters of its stem; leaves, their *arrangement*, *stipulation*, *composition*, *form*, *cutting of margin*, *surface* (whether glabrous, hairy, scabrous, tomentose, &c.), *venation*; inflorescence; bractæ; flower, its calyx, corolla, insertion of stamens; ovary, style, stigma.
10. Name, and describe similarly, No. 2.

EXAMINATION FOR DEGREE OF MASTER IN SURGERY.

DR. ADAMS.

1. Give a description of the acute œdema of the larynx of Bayle and Cruveilhier.
2. Under what variety of circumstances does the disease suddenly supervene?
3. Supposing the disease fully established, and a paroxysm of dyspnœa to have occurred, what prognosis is to be formed?
4. Supposing the necessity of making an artificial opening into the air passages in such a case is deemed indispensable, what operation, generally speaking, would you deem preferable?
5. The surgical instruments and appliances you would have in readiness?
6. From what injuries or from what surgical operations have you known, or read of, diffuse inflammation to have arisen?
7. What is the nature of the fever which in general attends on a diffuse phlegmon or diffuse inflammation?
8. What are usually the precursory symptoms of death when it occurs as the result of diffuse inflammation and suppuration?
9. When fatal phlebitis has occurred after amputation of the thigh, in what internal organs would you look for the anatomical characters of the disease?
10. Suppose you are called to the case of a young soldier who had had

a bayonet wound from behind of the gluteal artery at its root, or that a traumatic aneurism had formed there demanding operation, how would you proceed to secure the vessel?

SURGERY.

DR. SMITH.

1. Describe that form of paronychia termed "gangrenosa."
2. Mention the functional and physical signs of fractures of the cartilages of the larynx.
3. Describe mercurial erethismus.
4. In what cases would you employ mercurial fumigation? What preparation of mercury would you use? Mention Mr. Colles's mode of fumigation.
5. Describe Mr. Hey's mode of treating procidentia ani.
6. What treatment would you adopt in a case of strangulated hernia with gangrene of the intestine?
7. How would you treat a scorbutic ulcer?
8. Mention Sir Benjamin Brodie's plan of treating varicose veins.
9. Describe the varicose ulcer.
10. What are the characters of the ulceration of the eyelid described by Dr. Jacob?

ANATOMY AND PHYSIOLOGY.

PROFESSOR M'DOWEL.

1. Describe the ligaments of the bladder, and give the parts related to each.
2. Describe the steps of the operation for ligaturing the posterior tibial artery, and enumerate the structures which are divided in succession.
3. Enumerate in order the coverings of the testis, and mention the particulars in connexion with the descent of the testis in the foetus.
4. Describe the appearances seen on laying the pharynx open from behind. Mention the circumstances connected with the act of deglutition, and the nerves which are concerned in that process.
5. The composition of the bile, and its influence on digestion?

DR. STOKES.

1. Explain the general disuse of the antiphlogistic treatment in fevers and in local diseases.
2. What is the nature of the pulsating empyema? Is the disease always an empyema of necessity?
3. Write a form for the endermic use of digitalis.
4. What is now generally held to be the immediate cause of convulsions in fever?
5. What lesion of secretion is apparently connected with puerperal convulsions?

THEOLOGICAL EXHIBITION EXAMINATION.

Biblical Term.

REV. JOSEPH CARSON, D. D.

Isaiah, vii., viii., ix., xi., xxv., xxvi., xxxii., xxxv.

A.—1. What prophetic writers were contemporary with Isaiah in the kingdoms of Judah and Israel? Which of these affords most assistance in interpreting his prophecies?

2. Isaiah refers to the significance of his own name, as well as of those of his two sons? A singular mistake was made by some of the early Fathers with regard to the father of the prophet?

3. What passage of Isaiah is adduced to prove that he was not himself the compiler of the book of his prophecies? Show that the objection is untenable.

4. Isaiah, in various passages, bears testimony to the authenticity of the historical narrative of the Pentateuch?

5. Give a brief sketch of the principal arguments for the integrity of the whole book of Isaiah.

B.—1. vii. 15, 16. חמאה דבש יאכל לעתו מאס ברע ובהור בקוס :

כי במסד ידע הנער מאס ברע ובהור בקוס

חשוב דאדמה אשר אזה קץ מסבי שני מלכה :

(a). Translate these verses accurately, and explain their connexion with the remainder of the prophecy. How is לעתו rendered by the LXX?

(b). "Cream and honey, abundance of the best food shall he eat, when, ten or twenty years hence, he comes to the age of discretion." State your opinion of the correctness of this paraphrase of the words חמאה דבש יאכל. How were these words understood by the ancient Fathers?

(c). Explain the grammatical construction of the words אשר אזה קץ מסבי. The verb קץ occurs in another verse of this chapter, with what signification?

2. viii. 3.

הלקי ביהודה ששף ועבר עד צהר יגיע

יהיה מסות כנעני מלא רחב ארץ עמנו יל :

(a). Affix the points, and translate. What is the subject of the verbs הלקי and ששף? Explain the metaphor in כנעני.

(b). The last two words of the verse are written separately in most MSS.; how may the Authorized Version be defended, which unites them into a proper name?

(c). This verse has proved a great stumbling-block both to Jewish and Rationalist commentators? How have they respectively dealt with it?

3. ix. 5, 6. : וקרא שמו מלא יענץ אל גבור אבי עד שר שלום :

לזכרה המשיח ולשלום אין קץ :

(a). Affix the points, and translate. How do the Rabbinical writers explain the *Mem clausum* in לזכרה ?

(b). Two modes of evading the Messianic interpretation of this prophecy have been put forward ? Each of them is opposed to the context of the whole passage, as well as to its grammatical construction ?

(c). How does Gesenius render the words אל גבור ? This is contradicted by the sense which the same words confessedly bear in a passage in the next chapter of Isaiah ?

4. xi. 1. : ויצא חסר מנוח יש והצר משרשי יסוד :

(a). Translate this verse, and point out its connexion with the closing verses of the preceding chapter. The introduction of Jesse's name agrees with the whole purport of the prophecy ?

(b). Give the exact meanings of חסר and צר. The first word is found only in one other passage ?

(c). Besides these titles, the similar metaphorical appellations, צָחַק, שֹׁשֶׁבֶת, and יָקָן, are applied in prophecy to the Messiah ; cite the passages in which they respectively occur.

5. xxvi. 3. : יצר סמך חצר שלום שלום כי כך בנחם :

(a). Translate, and give the renderings of the LXX. and Vulgate.

(b). Give some other examples of the same use of the word יצר. What is the root of חצר ?

6. xxvi. 19. : ידיו מוחך נבלי יקמון הקיצ והנו שכני ער :

כי מל אורח מלך חוצץ רשעים חקל :

(a). Affix the points, and translate. The Vulgate renders מל אורח by *ros lucis* ; are there any objections to this ? Has the word אורח elsewhere the meaning given to it here in the Authorized Version ?

(b). Give a short account of the various interpretations proposed for this verse. In what other passages of Scripture is the verb הקיצ applied to the Resurrection ?

(c). This is one of the passages which Gesenius asserts to be of a later date than the time of Isaiah ? Point out the weakness of this objection.

7. ix. 13, sq. : ויסת יחזה מישואל ראש חרב כסה ואבן יס אדן :

וקן ונשוא פנים הוא הראש ונבא מוחה שר הוא דוקב :

ידיו מאשר העם הזה מוחלים ומאשרו מבלעים :

(a). Affix the points and accents to these verses, and translate.

(b). Give the derivation of the following words : כסה, ואבן, and נבא. The root of the last word is never used in any active conjugation ; what inference does this fact suggest ?

First Morning.

OLD TESTAMENT.

REV. JOSEPH CARSON, D. D.

1. Our Lord employs the same language to express the permanence of the Old Testament, and of His own revelations ?
2. How does it appear (according to Dr. Lee) that our Lord did not confine this solemn ratification to any particular portion of the Old Testament ?
3. In what passages of his Epistles does S. Paul apply the title *ἡ γραφή* to the Book of Genesis ?
4. He speaks of the Book of Exodus under a similar title ?
5. One particular part of the arrangements of the service of the tabernacle is ascribed in the New Testament to the direct inspiration of the Holy Spirit ?
6. What historical facts narrated in the Pentateuch are typically applied by our Lord ?
7. The Book of the Law is referred to as a written document in one of the Psalms ?
8. David, in one remarkable passage, lays express claim to divine inspiration ?
9. The land of Egypt is used as a medium of comparison in three passages of the Pentateuch ?
10. The fidelity with which the Jews preserved their canonical writings affords no small proof of their divine inspiration, according to Dr. Lee ?
11. In what point does the stress of this argument chiefly lie, according to Mr. Davison ?
12. On how many occasions is a pillar said to have been set up in the patriarchal history ?
13. What was the first historical event which Moses was commanded to put in writing ?
14. Mr. Blunt has pointed out what appears to be an undesigned coincidence in this part of the narrative of Exodus ?
15. Many circumstances tend to prove that the art of writing was diffused to some extent among the Israelites about the time of Moses ?
16. What is the earliest mention of a seal ring among the Israelites ?
17. The art of writing appears to have been generally known and diffused in the times immediately following the Mosaic period ?
18. Which of the tribes of Israel, in the time of the Judges, seems to have acquired peculiar pre-eminence in this respect ?
19. A circumstance recorded in the history of Gideon proves that a knowledge of writing was then general, even among the tribes on the east of Jordan ?

20. What command was given in the Pentateuch for the public and solemn reading of the Law?

21. Graves suggests a probable reason for choosing this particular period?

22. How many fulfilments of this command are recorded in the sacred narrative?

23. On two remarkable occasions in Jewish history a public and solemn homage was paid both by kings and people to the sacredness of the Mosaic law?

24. In the first of these events—that in the reign of Hezekiah—Graves notices one particular expression of the sacred historian, as proving that the authority of the Pentateuch was universally acknowledged?

25. How does it appear that at the public reading of the Law in the time of Ezra, a portion of the Book of Leviticus was gone through?

26. What proof of reverence for the Book of the Law was given by Jehoshaphat?

27. The sacred historian notices the fact, that one of the wicked kings of Judah possessed a knowledge of, and complied with, one of the precepts of the Mosaic Law?

28. What instance is recorded of the authority of the Mosaic Law being recognised in the kingdom of Israel under one of her most idolatrous kings?

29. Among the ancient prophets, the references which Micah makes to the history of the Pentateuch are especially remarkable?

30. The tribes of Levi and Judah were united at an early period by marriage?

31. This fact proves that the interval between the descent into Egypt and the Exodus cannot be restricted to *four* generations only?

32. The same conclusion is still more remarkably evident from the account which is given of the genealogy of Joshua?

33. How many cities were appointed in the land of Israel for the Levites?

34. Was permission ever granted to the Levites to leave the city to which they belonged by birth?

35. The age of Moses at his death was less than that of his father and grandfather?

36. After the time of Joshua, what is the next instance in which the age of an individual at death is recorded?

37. But one person of the name of Gamaliel is mentioned in the Old Testament as well as in the New?

38. How many persons in Scripture history are said to have had names given to them from having been born at a time of calamity?

39. The sin-offering for sins of ignorance was different for the congregation, for the ruler, and for any of the people?

40. The scape-goat on the day of atonement was not the only instance of one of two victims being let loose, while the other was slain?

41. In the ordinances for the cleansing of leprosy, there was one remarkable peculiarity with regard to the *manner* of the sacrifice?
42. Why were two victims appointed in certain cases of purification?
43. Graves has remarked that the three great feasts of the Jews were all commemorative of the miraculous deliverance from Egypt?
44. The design of the Passover was somewhat different from that of the feast of Tabernacles, when they were considered as memorial festivals of past mercies?
45. In this point of view, the ordinance regarding the offering of the first fruits was peculiarly significant?
46. What day was appointed for observing the feast of Weeks?
47. Does this law decide the question, whether the feast of Pentecost after our Lord's ascension fell on a Lord's day or not?
48. What command was given in the Pentateuch with regard to the mourning of priests?
49. The omission of this duty, by Divine command, was made a sign to the Israelites on a remarkable occasion in later history?
50. The tribe of Levi was a standing memorial of the miraculous deliverance of the children of Israel from Egypt?
51. Graves has pointed out certain peculiar marks of truth which characterize the miracles of the Pentateuch?
52. On what grounds does he rest the presumption that the last four books of the Pentateuch were really composed by an eye-witness of the events recorded?
53. Various circumstances which it was necessary to notice on the entrance of the Jews into Canaan appear for the first time in the Book of Deuteronomy?
54. The same remark applies to a difference which exists between Exodus and Deuteronomy in the wording of one of the Ten Commandments?
55. The military confederacies of the Midianites and Philistines had one point of resemblance?
56. The names of the five kings of Midian slain by Moses are mentioned on more than one occasion?
57. Mr. Blunt has pointed out an undesigned coincidence in the Scripture narrative, based on the fact that Balaam is said to have been slain among the Midianites?
58. He has made a similar application of the history of the manner in which Rahab concealed the two spies?
59. What incidental statement of the sacred narrative confirms the account which it gives of the time of year at which the Israelites passed the Jordan?
60. Is any other event in Scripture history, besides the miraculous passage of the Israelites, said to have taken place at the flood-time of Jordan?
61. All the cities of the Canaanites, the capture of which took place

after the victory over the five kings at Makkedah, fell before Joshua at once, with but one exception?

62. Is this fact apparently accounted for by any other passages in Scripture history?

63. On what occasion is a "Covenant of Salt" mentioned in the Pentateuch?

64. This expression appears once again in one of the historical Books?

65. One feature of the desolation produced by the Canaanites in the time of Deborah had been predicted in the Pentateuch?

66. More than one prediction of the Pentateuch was fulfilled in the time of the prophet Elisha?

67. At what period in Jewish history was there war between the Ishmaelites and Israelites?

68. To what cause does the sacred writer ascribe the victory of the Transjordanite tribes in this war?

69. The first public act of blasphemy and the first idolatry among the people of Israel both took place in the same tribe?

70. The great victory of Gideon over the Midianites is noticed on two occasions by the prophet Isaiah?

71. What place was celebrated in later Scripture history as the scene of the death of Jabin and Sisera in the time of Deborah?

72. Though Endor is not mentioned in the Book of Judges as the place of Sisera's death, yet the substantial agreement in the two statements may be readily inferred?

73. Mount Hermon is said to have been known by three names in Scripture history?

74. How is the fact of the Sidonian name of the mountain being mentioned accounted for by Mr. Blunt?

75. The rigorous policy of forbidding workers in iron among the Israelites, which existed in the days of Saul, appears to have been enforced by the Canaanites as early as the time of Barak?

76. In what cities only were the Anakims allowed by Joshua to dwell?

77. The first result of David's being anointed king over all Israel was to bring on a foreign war; from what quarter?

78. What was the result of this war?

79. One of the victories obtained by David on this occasion is alluded to by the prophet Isaiah?

80. On what occasions do the Philistines reappear in Jewish history after the time of David?

81. Whence did the Philistines originally spring, and how are they generally designated in the LXX.?

82. When David first attempted to bring up the Ark, where was it temporarily deposited after his failure?

83. What reason does Mr. Blunt suggest for this choice?

84. The battle between Absalom's troops and those of David is said to have taken place in the wood of Ephraim in the land of Gilead; how may the existence of a place of this name on the east side of Jordan be accounted for?

85. To what circumstance in Jeroboam's history may his choice of the worship of the golden calves be probably ascribed?

86. Jeroboam's idolatry was carried much further, however, than the worship of the golden calves?

87. Is the observance of the Sabbath ever alluded to in the historical books?

88. The Book of Job contains one striking reference to the land of Palestine?

89. The doctrine of original sin appears to be clearly indicated in this Book?

90. What passage in the Book of Job has been supposed to refer to the "Angel of Jehovah," so often mentioned in other parts of Scripture?

91. What are the chief points in which the doctrinal system of Elihu differs from that which is developed in other parts of the Book of Job?

92. The Book of Job furnishes several undesigned coincidences, which clearly attest the authenticity of the history?

93. One remarkable appellation is peculiar to this Book and the Book of Genesis?

94. The enigmatical character of some portions of ancient prophecy was perceived by the prophets themselves?

95. Some of the types of the Old Testament were prophecies, even in the most literal sense?

96. In this respect, what difference exists between types and prophecies, according to Mr. Davison?

97. What remarkable evangelical prophecy is contained in Hosea?

98. Two false prophets appear to have especially resisted Jeremiah in his prophetic office?

99. What injunction is contained in Zechariah with regard to the penalty to be inflicted on false prophets?

100. St. Paul, on one occasion, quotes a prophecy of Isaiah as "written in the Law"?

101. Ezekiel plainly intimates that the assent given by the Jews to the truth of his divine mission was a constrained and extorted assent?

102. In Isaiah but one prophecy is directed against an individual by name?

103. Similar predictions against private individuals occur both in Jeremiah and Amos?

104. What prophecies of Amos are quoted in the New Testament?

105. Two objections are made against the reference of Haggai's prophecy respecting the glory of the second temple to the time of our Lord?

106. How do the LXX. translate the text in Haggai?

107. The plural form is used by the same interpreters in translating another eminent Messianic prophecy?

108. The second objection can be easily shown to have but little weight?

109. Besides the prediction concerning the temple, Haggai contains another Messianic prophecy?

110. The closing words of Old Testament prophecy combined a retrospect to the Law with clear tokens of the advent of the Gospel?

REV. GEORGE LONGFIELD.

NEW TESTAMENT.

1. What MS. of the Scriptures is designated by the letter κ ? What are the contents of this MS.?—and what inference may be thence derived as to its age?

2. Does the fact that Codex A contains the Epistles of Clement warrant a similar conclusion as to its antiquity?

3. What affords the most certain evidence of the great antiquity of Codex κ ?

4. What proves it to be more ancient than the Vatican MS.?

5. This MS. supplies a valuable testimony to the genuineness of St. Matthew's Gospel?

6. Give an account of the *textus receptus* of the New Testament, and of the origin of the name.

7. If Griesbach's system of recensions be adopted, to which is the *textus receptus* to be referred?

8. How did Michaelis add to Griesbach's system of recensions? What representatives have we of the Edessene system?

9. What portions of the New Testament are wanting in the Peschito version?

10. The alterations in the text in the Alexandrine and Occidental recensions may be traced to different influences?

11. The assertion that the term *εὐαγγέλιον* is applied in the New Testament only to things orally described, and that its application to written documents is later than the Apostolic age, cannot be maintained?

12. In the Latin Church the order of the Gospels was different from that in our Bible; what was the reason of this?

13. Three different hypotheses have been maintained as to the original language of St. Matthew's Gospel?

14. What argument in favour of the Greek original has been founded on an examination of the quotations in this Gospel from the Old Testament?

15. On what grounds does Dean Alford question the statement of Irenæus with respect to St. Luke's Gospel, *Λουκᾶς δὲ ὁ ἀκόλουθος Παύλου τοῦ ὑπ' ἐκείνου κηρυσσόμενον εὐαγγέλιον ἐν βιβλίῳ κατέθετο.*—*Har.* iii. 1.?

16. What passage in St. Luke's Gospel indicates most plainly the effect of his intercourse with St. Paul?

17. The selection of parables and discourses of the Saviour made by St. Luke is thought to show the influence of the teaching of the great Apostle of the Gentiles?

18. Jerome alludes to an opinion held by some, according to which St. Paul himself recognised the fact (qu. 15) stated by Irenæus?

19. St. Paul perhaps in one place quotes St. Luke's Gospel?

20. What designation of the Eternal Son is peculiar to St. John's Gospel?

21. The now familiar designation of the Saviour, "Our Lord," ὁ Κύριος ἡμῶν, is found but in one place in the New Testament?

22. Is the Lord ever designated "Son of Man" after His ascension?

23. A mode of designating the Saviour in the concluding passage (xvi. 9-20) of St. Mark's Gospel has been regarded as a proof of the spuriousness of the passage?

24. What one parable is peculiar to St. Mark's Gospel?

25. An argument for the identity of authorship of St. John's Gospel and the Apocalypse has been derived from a quotation from the Old Testament found in both?

26. Dr. Lee remarks that we may infer from this quotation the principle on which the writers of the New Testament used the version of the LXX.?

27. What is there in the account of the census of Cyrenius (Luke, ii. 1, &c.) that speaks strongly for the accuracy of the chronology?

28. Marks of genuineness are strongly imprinted on the canticles in the first and second chapters of St. Luke's Gospel?

29. From what passage in one of St. Paul's Epistles is it inferred that St. Luke was a Gentile?

30. "He shall be called a Nazarene."—Matt. ii. 23. State the various interpretations that have been proposed of these words.

31. The mode of citing the words indicates that they were not intended as a verbatim quotation from one of the prophets?

32. "Now all this was done that it might be fulfilled which was spoken of the Lord by the prophet."—Matt. i. 22. What are the prepositions in the original, and what is the distinct import of each?

33. St. Luke gives us a valuable clue to one of the significancies of the Transfiguration?

34. A difference between St. Luke on the one hand, and St. Matthew and St. Mark on the other, as to a note of time connected with the Transfiguration, is harmonized by Augustine (de Doct. Christ.)?

35. A comparison of the accounts of the Transfiguration in St. Matthew and St. Luke brings to view a remarkable undesigned coincidence between the narratives?

36. In reference to St. Peter's allusion to the Transfiguration (2 Pet. i. 14, &c.), Dean Alford directs attention "to one of those remarkable

coincidences of words which lead men on in writing to remembrances connected with those words"?

37. "Ye have heard that it was said by them of old time, thou shalt not kill," &c.—Matt. v. 21. The margin here gives a more correct rendering? A deep truth underlies the omission of the subject with ἐρρέθη?

38. "And she being before instructed by her mother said, give me here John Baptist's head in a charger."—Matt. xiv. 8. The inaccurate rendering, "being before instructed," was probably suggested by the Vulgate? The word προβιβάζω is inaccurately rendered also in the only other passage where it occurs in the New Testament?

39. "Therefore the Jews sought the more to kill him because he had not only broken the Sabbath, but said also that God was his Father, making himself equal to God."—John, v. 18. The full weight of the testimony of this passage against the Arians is lost in this version of the original?

40. A similar objection applies to the rendering of a passage in the Epistle to Titus?

41. What is the chief objection to the rendering of this latter passage (Tit. ii. 13) in the Authorized Version?

42. A comparison of the narratives of the feeding of the five thousand in St. Mark and St. John, furnishes an instance of an undesigned coincidence in relation to the time of the year at which the miracle was wrought?

43. As to the numbers fed also, the narrative of St. John, compared with that of St. Matthew, affords an instance of a proof of truth arising from minute coincidence?

44. "This parable spake Jesus unto them, but they understood not what things they were which he spake unto them."—John, x. 6. To what do these words refer? What is the word rendered "parable"? Is it consistently so rendered?

45. "What ye hear in the ear, that preach ye upon the housetops."—Matt. x. 27. What allusion to a Jewish practice does Lightfoot find here?

46. In the account of our Lord's answer to the disciples of John relative to fasting, St. Luke supplies an important addition to the reports of St. Matthew and St. Mark?

47. What difficulty has been found in the answer which our Lord, by the parable of the good Samaritan, gave to the question of the lawyer, and what is the explanation of it?

48. There is probably a deeper meaning in this parable than the lesson of mercy which lies on its surface?

49. It has been observed that our Church has stamped with her approval this interpretation of the parable?

50. "And when he (Peter) *thought thereon*, he wept."—Mark, xiv. 72. What is the original, and what are the marginal renderings?

51. Notice the various modes which have been proposed of reconciling St. John with the Synoptists as to the last Passover?

52. It may be inferred, even from St. John, that the meal eaten by the Lord and His disciples was *in some sense* a Passover?

53. The peculiar character of the appearances of the risen Saviour furnishes a proof of the truth of that part of the Gospel narrative where they are recorded?

54. "Being seen of them forty days, and speaking of the things relating to the kingdom of heaven."—Acts, i. 3. The remarkable manner in which the period of time is here expressed in the original is not without significance according to Chrysostom?

55. The word *ἐκκλησία* occurs in two places only in the Gospels?

56. What is the difference of usage of the words *εὐλογητός* and *εὐλογημένος* in the New Testament?

57. The Holy Land in the time of our Lord consisted of five provinces?

58. When did Idumæa commence to be regarded as a part of Judæa?

59. With respect to the author's information on peculiar subjects, what instances of agreement have been pointed out between St. Luke's Gospel and the Acts of the Apostles?

60. St. Matthew does not display the same acquaintance with nautical phraseology?

61. That personal memoirs of Silas worked up into the narrative form the principal material of the latter part of the Acts, why not an admissible hypothesis?

62. Some writers find an intimation of the date of the Acts in a passage in the early part of the work?

63. What passage in the Acts is termed by Scaliger the "*crux chronologorum*"?

64. If Lachmann's reading of this passage (xiii. 20) be admitted, the difficulty is removed?

65. Dean Alford directs attention to a minute mark of truth in the account of the miraculous deliverance of Peter from prison, Acts, xii.?

66. "Which also our fathers that came after brought with Jesus into the possession of the Gentiles."—Acts, vii. 45. There are two inaccuracies in this rendering of the original?

67. What peculiarity has been remarked in the vision of the glorified Saviour by the dying Stephen?

68. How has the fact been explained by Chrysostom? This view is adopted by the framers of our Prayer Book?

69. What trace of the fatalism of the Pharisees do we find in the Acts of the Apostles?

70. "Whom therefore ye ignorantly worship, him declare I unto you."—Acts, xvii. 23. In two instances in this sentence the delicate turn of St. Paul's rhetoric is effaced in the Authorized Version?

71. In this speech (Paul's on Mars' Hill) there is preserved a remarkable reminiscence of Stephen's last speech?

72. The explanation of the apparent discrepancy in the narratives of

the conversion of Paul, Acts, ix. and xxii., is, according to some, found by attending to the different syntax in the two passages?

73. "When Gallio was deputy (*ἀνθυπατεύωντος*, i. e. pro-consul) of Achaia."—Acts, xviii. 12. Is this inconsistent with the statement of Tacitus, Ann. i. 76, that Achaia, originally a senatorial province, was made an imperial one by Tiberius?

74. "Phenice which is an haven of Crete, and lieth towards the south west and north west."—Acts, xxvii. 12. What is the harbour with which Phenice is identified? How is the Authorized Version here to be corrected?

75. The application of the term *βάρβαροι* to the inhabitants of Melita (Acts, xxviii. 2) affords a proof of the writer's accuracy?

76. What is the first in chronological order of St. Paul's Epistles, and what is its date?

77. "The heir is under tutors and governors until the time appointed of the father."—Gal. iv. 1, 2. What is the word in the original rendered "time appointed," and what is its proper signification?

78. "Bear ye one another's burdens."—Gal. vi. 2. "Every man shall bear his own burden."—vi. 5. The apparent discrepancy of these passages in our Authorized Version does not exist in the original?

79. What passage in the Epistle to the Galatians is cited in the canon of the Council of Trent in support of the dogma of *fides formata*?

80. What is the difference of usage of *ἐνεργεῖν* and *ἐνεργεῖσθαι* mid., in the New Testament?

81. In the Epistle to the Ephesians alone we find a mode of designating the divine purpose, which St. Paul employed in his speech at Miletus?

82. "Endeavouring to keep the unity of the Spirit in the bond of peace."—Eph. iv. 3. The change in the sense of the word *endeavour* makes this rendering now inadequate?

83. A passage in 2 Peter, where the word is used, suffers similarly?

84. "All things that are reprov'd are made manifest by the light: for whatsoever doth make manifest is light."—Eph. v. 13. The Authorized Version is here doubly wrong?

85. The first verse of the Epistle to the Philippians contains an indication of its late date?

86. The affectionate disposition of the members of the Church of Philippi towards St. Paul, how probably to be explained?

87. We find in this Epistle a slight trace of the fact related, Acts, xvi. 13, that the Gospel was first received at Philippi by female converts?

88. What is inaccurate in the rendering of this passage (iv. 23) in the Authorized Version?

89. "It is God which worketh in you both to will and to do of his good pleasure."—Phil. ii. 13. The point of the original is lost in this rendering?

90. "Because for the work of Christ he was nigh unto death, *not re-*

garding his life."—Phil. ii. 30. What is the original here, and what the *varia lectio*?

91. "Having spoiled principalities and powers, he made a show of them openly, triumphing over them in it."—Coloss. ii. 15. This rendering is certainly inaccurate?

92. The verb *θριαμβεύω* is rendered differently in the Authorized Version in the only other passage in which it occurs?

93. "Let no man beguile you of your reward in a voluntary humility . . . intruding into those things which he hath not seen."—Coloss. ii. 18. This rendering is founded on an erroneous reading of the original?

94. What passage in the Epistle to the Colossians, by its inaccurate rendering in our Version, furnishes a weapon to Arianism?

95. What is remarkable as to the manner in which Aristarchus and Epaphras are mentioned in the Epistles to the Colossians and Philemon, which were written about the same time?

96. What is Meyer's hypothesis to account for this?

97. It seems likely that the misapprehension of the Thessalonians as to the near approach of the last day was caused, partly at least, by an epistle forged in Paul's name?

98. What is Paley's argument for the genuineness of both Epistles founded on this passage (2 Thess. ii. 1, 2)?

99. "Knowing, brethren beloved, your election of God."—1 Thess. i. 4. What alteration in the original would be necessary that this reading might be admitted?

100. "For they that have used the office of deacon well, purchase to themselves a good degree."—1 Tim. iii. 13. Notice the various interpretations of *βαθμὸν καλόν*. Which seems most in accordance with the context?

101. What is the propriety in the Apostle's designation of the writer from whom he quotes the line:

Κῆρυξ ἀσι ψεύσται, κακὰ θηρία, γαστέρες ἀργαί.—Tit. i. 12?

102. "And hope maketh not ashamed, because the love of God is *shed abroad* in our hearts."—Rom. v. 5. An inaccuracy in the version of the Vulgate here has obscured the interpretation of this passage for many ages?

103. "For now we see through a glass darkly."—1 Cor. xiii. 12. The Authorized Version probably requires two corrections here?

104. "We are not as many, which corrupt the word of God."—2 Cor. ii. 17. What addition should be made to the words of the Authorized Version here to bring out the sense fully, according to Bentley?

105. Our translators were led to this inadequate rendering of the original by another passage in this Epistle?

106. "For we must all appear before the judgment seat of Christ."—2 Cor. v. 10. Chrysostom's commentary on this passage shows that he would not have been satisfied with the rendering of our translators?

107. An ancient opinion to account for the absence of a superscription to the Epistle to the Hebrews was, that St. Paul would not write to the

Jews as their Apostle, because he regarded the Lord himself as their Apostle; what passage in the Epistle was appealed to in support of this opinion?

108. The internal evidence as to the date of this Epistle is obscured in the case of one passage by an unauthorized change of tense in our Version?

109. "For the law made nothing perfect, but the bringing in of a better hope did."—Heb. vii. 19. Show that this, as well as the marginal rendering, is inadmissible.

110. "The answer of a good conscience towards God."—1 Pet. iii. 21. The usage of the LXX. suggests a different rendering of these words?

111. Show that St. Peter, in his reference to the Creation and the Deluge (2 Pet. iii. 5, 6), recognises and adopts the Mosaic record?

112. In one of St. Paul's Epistles we find a probable allusion to the Lord's Prayer?

113. Two distinct expressions in the original are rendered by the words "Holy Scriptures" in the Authorized Version? What is the difference of meaning between these expressions?

114. The term "Scripture" is on more than one occasion in the New Testament used as if synonymous with God its Author?

115. The passages in the Epistle to the Galatians in which St. Paul puts forward the fact, that his knowledge of Christian doctrine was not derived from intercourse with the other Apostles, are important in their bearing on a modern theory of inspiration?

116. "The Comforter . . . shall bring all things to your remembrance."—John, xiv. 26. Notice some specific fulfilments of this promise

117. In opposition to the theory of those who would restrict the influence of the Spirit to the *contents* of the Apostles' writings, we find St. Paul claiming the same divine guidance for the language which he employs?

118. What fact supplies a direct answer to the assertion that the writers of the New Testament quoted the Old Testament from memory?

119. How does Dr. Lee classify the quotations from the Old Testament in the New?

120. What different words in the original are rendered by the word "conversation" in the Authorized Version?

121. What important element of the verb is almost wanting in the Greek of the New Testament?

ST. AUGUSTINE DE DOCTRINA CHRISTIANA.

1. That the Scriptures are in part clear, in part obscure, is shown by Augustine to be a wise adaptation to our wants?

2. He shows that important ends are fulfilled by the obscurity and ambiguity of Scripture?

3. By what passages of Scripture does he illustrate his remarks on this subject?

4. He maintains that, on the whole, we lose nothing by the obscurity of Scripture?

5. He holds that all essentials are *clearly* revealed?

6. He alludes to the numerous Latin versions of the Scriptures in his time? Did he think that evil resulted from this multiplication of versions?

7. "Nonnullas obscuriores sententias codicum sæpe manifestavit inspectio." By what examples does he illustrate this observation?

8. What rule does he lay down for the interpretation of a passage ambiguous in punctuation, where neither the *præscriptum fidei* nor the context determines the sense?

9. What example does he give of an ambiguous passage of this character? Is there any ambiguity in the original?

10. What is the difference between "percontatio" and "interrogatio"? What gives occasion to Augustine to notice this distinction?

11. The canon of the Old Testament as fixed by the Council of Carthage, A. D. 397, agrees with that given by Augustine (de Doctr. Christ., lib. ii.). With what reservation was this canon adopted by the Council?

12. Which of the Apocryphal Books are omitted in the Catalogue of Augustine, and how is the omission of these Books to be accounted for?

13. After enumerating the books which he places in the Canon, he says: "His quadraginta quatuor libris testamenti veteris terminatur auctoritas." In his "Retractations" he says that he departed here from Apostolic phraseology?

14. What opinion did Augustine hold as to the legend of Aristeas as to the formation of the Septuagint version?

15. He assigned extravagant value to this version? And on what grounds?

16. How does he divide the ambiguities of Scripture arising from words?

17. What general canon does he lay down for determining whether scriptural language be figurative or not?

18. He notices an objection to the employment of this rule? On what grounds does he state that the immutability of moral distinctions was questioned in his time?

19. How does he reply to such sceptics?

20. Progress in true spiritual feeling may lead to the misapprehension of Scripture; in what way?

21. What, according to Augustine, is the distinction between "flagitium" and "facinus"?

22. He gives a judicious caution as to the way in which we should regard an expression known to be figurative when occurring in different places?

23. The expressions to which this rule applies fall into two classes? Give examples of each.

24. If a precept seems to command a sinful or criminal action ("flagitium aut facinus"), it is figurative; what is the first example which he gives of the application of this rule?

25. "If thine enemy hunger, feed him; if he thirst, give him drink: for in so doing thou shalt heap coals of fire on his head."—Rom. xii. 20. How does Augustine arrive at the meaning of the latter clause of this passage?

26. We find in Scripture not only examples of many kinds of tropes, but also the names of some?

27. The work of Tichonius on the interpretations of Scripture ("regularum"), Augustine says should be read with caution; for what reasons?

28. He shows that this work did not, as the author thought, exhaust the canons of Scriptural exegesis?

29. The third rule of Tichonius was entitled by him "de promissis et lege;" how might it be otherwise designated? To term it *a rule* is not, according to Augustine, an accurate mode of speaking?

30. The want of an intelligent view of the matter to which this rule related lay at the root of a great heresy?

31. The discussion of Tichonius on this subject was unsatisfactory; why was this natural? What texts of Scripture might have suggested juster views?

32. Explain and exemplify the rule "de specie et genere."

33. What example does Augustine give of the application of the rule "de recapitulatione"?

34. The rule of Tichonius "de temporibus" relates either to "synecdoche" or "numeri legitimi;" what is meant by the latter expression?

35. What is meant by a *solecism* as distinct from a *barbarism*?

36. Augustine directed attention to a desideratum in theological literature which has since been often supplied?

ECCLESIASTICAL HISTORY.

DR. LEE.

The following Questions, amongst others, were proposed vivâ voce to the Candidates:—

1. Gibbon unjustly criticizes the accounts given by Hegesippus and Clemens Alexandrinus as to the internal condition of the Church?

2. How does Dr. Burton illustrate the early use of the word "heretic"?

3. The statement of the early Fathers as to the source of Gnosticism may have a symbolical meaning?

4. Cerinthus, on the one hand, and Basilides and Valentinian on the other, may be taken to represent two elements of Gnosticism?

5. Which of the early heretics is a hero with Neander?

6. Wieseler seems to have fixed satisfactorily the date of the arrival of S. Peter at Rome?

7. Whence the pause in persecution under Commodus? There was a remarkable instance of martyrdom in his reign?

8. How was Montanism originally regarded in the East and West, respectively?

9. In what respect is the name of Praxeas historical? What important inference does Neander draw from this?

10. What is the Greek tradition, accepted by Baronius, as to the first preacher of the Gospel at Carthage?

11. What is the earliest *historical* account of the Church of Carthage?—what of the constitution of the North African Church?

12. Whence can we derive *data* as to the succession of the earliest Bishops in the North African Church?

13. Enumerate the names down to S. Cyprian.

14. Certain statements of S. Augustine, as well as certain facts relating to the Donatist Controversy, require a modification of the common notion as to the great extension of Christianity in North Africa?

15. The Donatist schism led to grave political results?

16. By whom were the Vandals invited to Africa?

17. Two events may be said to sum up the subsequent history of Africa?

18. What fact illustrates the condition of the African Church in the eleventh century?

19. To which of the Roman emperors was the description of the Beast, Rev. xiii. 5, attributed by a contemporary Father?

20. What was the fate of the original MS. of Origen's Hexapla?

21. There is a common error as to the Synod at which certain propositions ascribed to Origen were condemned?

22. The manner in which Novatian procured episcopal consecration testifies to an important canonical rule?

23. Can you state any other instances of the observance of this Canon?

24. The insinuation of Gibbon that it was the Christians who set fire to the palace at Nicomedia is refuted by Dean Milman?

25. The Emperor Julian recognized the *social* benefits conferred by Christianity?

26. What, according to Neander, was the heretical creed signed by Pope Liberius?

27. What innovation in an important rite are the Eunomians said to have introduced?

28. The title *θεωρόκος* was frequently used before the age of Nestorius?

29. What document did the Council of Chalcedon sanction as a bulwark against both Nestorianism and Eutychianism?

30. During the vacillation of Pope Vigilius in the affair of the "Three Chapters," under whose advice did the Roman clergy act?

31. How was the West represented at the Fifth General Council?

32. Whence, and under what law, arose the political power of the Western Bishops in the fifth and sixth centuries ?

33. On what authority are we able to set aside the statements of Neander and Dean Milman as to the excessive wealth of the bishops at this period ?

34. In what public transactions did Epiphanius of Pavia take part ?

35. Who were the ancestors of Pope Gregory the Great ?

36. On what grounds do the interpreters of unfulfilled prophecy regard the year 606 as an era from which to reckon ?

37. Is there historical evidence for this ?

38. As to the progress of the Primacy claimed for Rome, Hallam has fallen into an error ?

39. What was the grand charter, in early times, in defence of Church property ?

40. When Charlemagne authorized Pope Adrian's collection of Canons, he made a remarkable exception ?

41. What is the history of the hymn composed by the Emperor Justinian ?

42. In what year were the Mohammedans defeated by Charles Martel ? In what year did they menace Rome ?

43. How long did Jerusalem remain in the *undisturbed* possession of the Mohammedans ?

44. What were the date and object of the Synod of Bethlehem ?

45. What was the effect of the Crusades on the Papal power ?

46. Who waged the last strife between the house of Hohenstauffen and the Church ?

47. Who was the rival of Philip the Swabian for the Empire ?

48. When did Tanchelin of Antwerp teach ? What subsequent sectaries did he resemble ?

49. Who were the Insabatati, and whence the name ?

50. How did Paulician Manichæism find its way to Europe ?

51. What limits does Mr. Maitland place to the appearance of Manichæism in the West ?

52. When and where was the first assembly of Dominicans held ?

53. Who were the two great luminaries of this Order ? Who were the chief Schoolmen among the Franciscans ?

54. Innocent III. does not receive credit from Dean Milman for the sagacity with which he regarded the great religious event of his Pontificate ?

55. What practical evidence is there of the light in which the unreformed Church regarded Innocent ?

PROFESSOR OF DIVINITY.

ARTICLES AND LITURGY.

1. Two important questions have been raised respecting the construction of the Statute 13 Eliz. c. 12, which legalizes the Articles?
2. When was the number of the Articles definitively fixed at thirty-nine?
3. The question as to the Edition of the Articles sanctioned by the above Statute has been raised in connexion with two very distinct controversies?
4. The other question, *scil.* whether the Statute contemplated only the *doctrinal* Articles, turns on the interpretation of one clause?
5. The Elizabethan Articles of 1562 subsequently received one, and only one, positive addition?
6. The Church of England commences her symbol of faith—the Articles—in a way strikingly similar to the Tridentine symbol?
7. One expression in the fourth Article plainly appears to be directed against a Lutheran dogma?
8. A similar protest against Ubiquitarianism, contained in the second Edwardine Prayer-book, was omitted in the Elizabethan?
9. The doctrine of the double procession of the Holy Ghost is explicitly declared both in the Articles and in the Prayer-book?
10. The opinion of our Reformers respecting the *inspiration* of the Scriptures is clearly expressed in the Latin version of the sixth and twentieth Articles?
11. The Westminster Confession differs wholly from our Article respecting the criterion of Holy Scripture?
12. On what ancient authorities does the Church of Rome mainly rely in support of her Canon?
13. The word “symbolum,” as applied to the Creeds, may perhaps be derived from the Catechumenical discipline?
14. There are five Articles in which the doctrines of the Church of Rome, though not explicitly mentioned, are plainly alluded to, and materially modified?
15. The ninth Article is directed against a Romish error, and also against one maintained by some of the Reformers?
16. Calvinists prefer the Latin version of this Article; Arminians the English:—why so?
17. The Pelagian principles respecting the absolute freedom of the will were, according to Jerome, derived from an earlier Patristic source?
18. What led Origen and some other of the earlier Fathers to make such extreme statements on this head?
19. By what distinction did the Schoolmen endeavour to explain away St. Paul’s statements respecting justification by faith?
20. The eleventh Article seems clearly to allude to the Scholastic fiction of *fides formata*?

21. The Augsburg Confession expressly guards against a possible misconception of the reformed doctrine, "*fide justificamur*" ?

22. The expression "mortal sin" occurs in our Articles ?

23. Who first broached the error on this head confuted in the sixteenth Article ?

24. How does Jeremy Taylor explain the Patristic statements which seem to favour the Novatian heresy ?

25. What is the statement of our Article respecting the indefectibility of grace ?

26. The Liturgy speaks the same language on this head as the Article ?

27. The Arminian theory of *provision* was distinctly stated by two at least of the early Fathers ?

28. The doctrine of Ecclesiastical Election was in effect affirmed by an early Council ?

29. Bossuet and other Romish writers have endeavoured to discover the Augustinian doctrine of predestination in an earlier Father ?

30. All the Tridentine divines were agreed on one point regarding predestination ?

31. One of the latter clauses of the seventeenth Article seems to decide that the Calvinistic views were not intended to be propounded by its framers ?

32. On three out of the five Points the English Reformers were decidedly at variance with Calvin ?

33. The doctrine of particular redemption is absolutely refuted both in the Articles and Liturgy ?

34. The Scriptural investigation of the doctrine of Election is rendered unnecessarily difficult in our Authorized Version ?

35. What error is expressly anathematized in our Articles ?

36. How is it designated in the *Reformatio Legum* ?

37. The Church of England interprets the maxim, "*nulla salus extra Ecclesiam*," quite differently from the Church of Rome ?

38. When do we first meet with formal definitions of The Church ?—and what gave occasion to them ?

39. What is the definition of it given in our nineteenth Article ?—and whence was it derived ?

40. The essential relation of the Sacraments to the Church is strongly stated by Augustine ?

41. Show that the proposed alteration of "*the Visible Church*" into "*a Visible Church*" in the nineteenth Article is inadmissible.

42. What are the Notes of The Church laid down in the Homilies ?

43. One of these is omitted in the nineteenth Article ? How is the omission to be accounted for ?

44. The definition of The Church by Bellarmine differs from that given by the Reformers in only one material particular ?

45. Where in the Liturgy is The Church regarded as coextensive with all professing Christians?

46. Where in the Liturgy is it specially designated the "mystical body" of Christ?

47. In the fifty-fifth Canon there is an important distinction between The Church and the Churches?

48. In the nineteenth Article two of the asserted prerogatives of the Church of Rome are denied?

49. According to Dr. Hey, what error of the Eastern Churches is referred to in this Article?

50. The word "schism" occurs twice in the Liturgy?

51. What is the definition given of it in the occasional Service?

52. The importance of establishing the disputed clause of the twentieth Article has been needlessly exaggerated?

53. The statement in question was not a novel one among the Reformers?

54. Why were the Queen and her Council so desirous of an explicit assertion of the authority of the Church?

55. The first Œcumenical Council furnishes a historical commentary on this clause of Article xx.?

56. The ancient Councils generally followed the maxim of the Council of Nice in the decision of points respecting which Scripture is silent?

57. The authority of the Church is limited by our Articles both as regards the deciding of controversies of faith and the ordaining of rites and ceremonies?

58. In the matter of Church authority the Church of England has been charged with inconsistency?

59. Bishop Marsh rejects some replies to this charge, as being evasions rather than confutations of it?

60. It is of no avail to deny the genuineness of the first clause of the twentieth Article?

61. The authority claimed by the Church of England in this clause is not (as Barnet says) one of deference and respect, but of positive obligation?

62. How does Bishop Marsh vindicate the Church of England from the charge in question (58)?

63. The solution of the difficulty as to the compatibility of the authority of the Church with the exercise of the right of private judgment is very simple?

64. To the existence of a Church as a *society* three things are essential?

65. The permission of withdrawal from the Church was not always accorded by the reformed Church of England?

66. The twenty-first Article lays down three principles respecting General Councils?

67. The supreme authority of Scripture in the decision of controversies of faith was very significantly expressed by the ancient Councils?

68. The general belief of the Western Church in Purgatory dates from what epoch?

69. The Scripture proofs alleged by Romanists in favour of Purgatory are of two kinds?

70. The modern doctrine of Indulgences differs widely from the form in which it was originally held?

71. When and by what Pope was the modern doctrine first distinctly enunciated?

72. The strongest plea urged by Romanists in defence of Image worship has been refuted by anticipation by Augustine?

73. How far is the Church of Rome justly chargeable with dealing unfairly with the second Commandment?

74. What were the *Libri Carolini*, and what was their object?

75. The respect paid to the relics of the saints in ancient times was the result of a twofold motive?

76. Mariolatry showed itself early, and was at once protested against?

77. The doctrine of the *immediate* glorification of the saints is essentially involved in the proof of two Romish dogmas?

78. There is a very ancient and high authority for extending the word *κληρoς* to others besides bishops, priests, and deacons?

79. Of the early Fathers only one is cited whose words seem to imply that the distinction between clergy and laity was not of apostolic origin?

80. What two Fathers are most confidently appealed to by Presbyterians in support of their system?

81. In one essential point these Fathers are against them?

82. Jerome's famous statement respecting the Church of Alexandria does not sustain the Presbyterian inference?

83. On what condition was Calvin willing to accept the episcopal form of Church government?

84. Cranmer for a time held a strange opinion regarding the power of ordination?

85. Lord Macaulay has asserted, on insufficient grounds, that the Church of England has contradicted in one of her synodic documents the principles laid down in the preface to the Ordinal?

86. The argument that, because all Christians are called priests in the New Testament, there should be no distinct order of ministers, can be easily refuted?

87. The twenty-fifth Article in its original form (1552) had an introductory sentence adopted from Augustine, and which was subsequently dropped?

88. In quoting Augustine's words in the original Article, a remarkable omission was made? How may it be accounted for?

89. On what grounds did the original Article refute the scholastic phrase "*ex opere operato*"?

90. The paragraph of the twenty-fifth Article relating to the five Romish sacraments underwent a curious change at the final revision in 1571?

91. Earliest extant application of the word "Sacramentum" to Christian usages?

92. How many Sacraments are acknowledged in the first Book of Homilies?

93. From what public document does it appear that even in Elizabeth's reign the number of the Sacraments was not definitively limited to two?

94. How far have the foreign Reformed Churches abolished auricular confession?

95. In what Church-of-England liturgical document was it allowed, but not commanded?

96. What is the teaching of our Prayer-book regarding private confession?

97. The only early Patristic authority alleged by Romanists in support of Extreme Unction is fatal to its recognition as a Sacrament?

98. The original Prayer-book of Edward VI. contained a trace of this Sacrament?

99. Augustine contrasts the Sacraments of the Old and New Dispensation in remarkable words?

100. Who were the first impugnors of the necessity of the Sacraments, and of the grace imparted by them?

101. In regard to the efficacy of the Sacraments, Calvin held the mean between Luther and Zuingli?

102. In what form did the question decided by Article xxvi. present itself to the early Church?

103. This Article meets an objection urged against the Orders of the Church of England by Romish divines?

104. What effects does the twenty-seventh Article attribute to Baptism in the case of those who rightly receive it?

105. Twofold effect of Baptism, according to Hooker?

106. What is the distinction, according to Waterland, between Regeneration and Renovation?

107. What was meant by "baptismus fluminis, flaminis, sanguinis," respectively?

108. In the doctrine of Baptismal regeneration there is confessedly one insoluble difficulty?

109. In two of the Articles Baptism and Regeneration are identified?

110. The sources from which our Office for Infant Baptism was drawn are important elements in deciding the controversy respecting Baptismal Regeneration?

111. The omission of any explicit direction on the part of our Lord respecting the Baptism of Infants is rather an argument in its favour than against it?

112. What theory of Infant Baptism was the twenty-ninth Canon framed, partly at least, to refute?
113. The original draft of Article xxviii. contained an important paragraph not found in our present Article?
114. The importance attached to it appears from another contemporaneous document?
115. Give an account of the subsequent omission of this paragraph.
116. What distinction is intended in the words, "*atque adeo ritè, dignè, et cum fide sumentibus,*" &c.?
117. Of the four reasons given for the rejection of Transubstantiation, which was added at the revision in 1562, and why then?
118. The adoration of the Eucharistic symbols is directly opposed to the teaching of the Church of England?
119. Did the Reformed English Church ever permit reservation of the elements? When was it prohibited?
120. In the Romish Church there exists an esoteric as well as an exoteric doctrine regarding the Eucharist?
121. Hooker observes that, after Luther's death, the Lutherans and Zuinglians seemed to have come to a general agreement concerning that which alone is essential in the Eucharist?
122. Cranmer's views respecting the nature of the presence in the Eucharist passed through several phases?
123. In the second Prayer-book of Edward three important changes were made in the Communion Service; which have been thought to savour of Zuinglian tendencies?
124. The words of the Elizabethan Book of Homilies are very express against Zuinglian tendencies?
125. The history of the twenty-ninth Article is remarkable?
126. How has its omission from the printed copies of 1562 been accounted for?
127. This twenty-ninth Article is a necessary corollary from the twenty-eighth?
128. The ancient Liturgies have been appealed to against the doctrine of the twenty-ninth Article?
129. Such an inference from the prayer of Invocation cannot be sustained?
130. In the earliest extant Patristic account of the administration of the Eucharist, both species are mentioned?
131. The practice of communion under one kind was a natural consequence of another Romish dogma?
132. Scripture seems decidedly opposed to the doctrine of concomitance?
133. The decision of Pope Gelasius on the subject of half-communion is very striking?
134. The condemnation of the Romish dogma of the Sacrifice of the

Mass is deduced, in our thirty-first Article, as a necessary consequence from a doctrine of Scripture?

135. Earliest instance of the application of the word *θυσία* to the Eucharist?

136. In the New Testament we find the word *θυσία* applied in the general sense of an oblation or offering?

137. "Spiritual sacrifices" is a Scripture phrase?

138. Who first employed the remarkable phrase, so commonly adopted by the later Fathers—*ἀναμάρτος θυσία*?

139. The compilers of the Prayer-book, as well as those of the Articles, have manifested their disapprobation of the dogma of the Sacrifice of the Mass?

140. The history of the Prayer-book in its successive revisions illustrates the principle laid down in the thirty-fourth Article respecting Ceremonies?

141. What was the immediate object of the thirty-sixth Article?

142. When the use of the Reformed Liturgy was abolished in Mary's reign, why was the Ordinal specified by name?

143. When did the Ordinal become an integral part of the Prayer-book?

144. An objection was made by Romanists to the validity of the consecration of Anglican Bishops, prior to the last revision, founded on the words of consecration?

145. The Roman Pontiff is once expressly mentioned in our Articles?

146. Contents of the Prayer-book, as enumerated in the Title-page?

147. Six "Uses" are mentioned by name?

148. The different ancient Uses were all represented in the compilation of the Prayer-book?

149. What traces of other "Uses" beside that of Sarum do we discern in the Prayer-book?

150. The revisers of the last Prayer-book (that of Charles II.) did not regard their work as necessarily final?

151. The order of Prayer compiled for the Reformed Church of England is declared by its authors to be superior to the old Services in three main respects?

152. The "Moveable Festivals" fall into two general classes?

153. How many Immoveable Festivals are observed by our Church, and how many Moveable?

154. What is it that renders the determination of Easter so difficult a problem?

155. What is the Rule given in the Prayer-book for determining it?

156. How was this Rule modified by the Statute 24 Geo. II. c. 28?

157. How does this Rule differ from the Gregorian?

158. Show that the latter is the more correct?

159. Earliest and latest days on which Easter can fall?

160. Greatest and least number of Sundays after Trinity, and what is the condition for each, respectively?
161. The Gregorian correction of the Calendar was twofold?
162. When was the New Style adopted in England? What other change was then made in the year?
163. Each Leap Year has *two* Sunday letters?
164. One year in our Calendar had *three* Sunday letters?
165. What is meant by the Solar Cycle? Explain its secular correction?
166. If the Gregorian correction were rigidly exact, the Cycle of Sunday letters would be one of 200 years?
167. The time of Easter is a function of the Solar and Lunar years: What is the relation by which they are connected?
168. The second general Rubric prefixed to Morning and Evening Prayer has given rise to two much agitated questions?
169. What is the legal decision of the first point?
170. Whence the embarrassment in the decision of the second question? How was it got rid of by the Privy Council?
171. Earliest document in which the union of the Morning Prayer, Litany, and Communion Office is enjoined?
172. In one of our Services the Litany is actually incorporated with the Communion Office?

MR. LONGFIELD.

St. Augustine de Doctrinâ Christianâ.

1. Enumerate the chief exegetical works of Augustine.
2. With what special object did he compose the treatise *de Civitate Dei*?
3. At what time did he complete the treatise *de Doctrina Christiana*? From what allusion in the fourth book does this appear?
4. Quote the passage in the third book in which he describes the preparation with which the student should approach the study of the difficulties of the Scriptures.
5. He is rather unfortunate in the example by which he illustrates the utility of an acquaintance with history to the student of Scripture?
6. Show that he could not, consistently with the principles which he lays down, ascribe equal canonical authority to all the books of Scripture which (lib. ii. ch. 8) he includes in the canon.
7. Show that he did not consider the expressions, *Scripturæ divinæ* and *Scripturæ canonicæ*, to mean the same thing.
8. In the catalogue of the canonical Scriptures given by the third Council of Carthage, we find mentioned "*Salamonis libri quinque*." Augustine furnishes us with the explanation of this strange expression? In

this explanation he fell into an error which he himself noticed in his *Retractions*?

9. "In ipsis autem interpretationibus Itala cæteris præferatur; nam est verborum tenacior cum perspicuitate sententiæ."—ii. 15. State Bentley's famous emendation of this passage, and discuss its admissibility.,

10. Explain the rule of Tichonius, "*de Domini corpore bipartito*." How does Augustine propose to correct the name? Give an example of the application of this rule.

11. State the chief precepts laid down by Augustine as to the employment of the "*grande genus dicendi*."

12. Write translations of the following passages:—

"Cui Dominus ait: *vade et tu fac similiter*, ut videlicet eum esse proximum intelligamus, cui vel exhibendum est officium misericordiæ, si indiget, vel exhibendum esset, si indigeret. Ex quo est jam consequens, ut etiam ille, a quo nobis hoc vicissim exhibendum est, proximus sit noster. Proximi enim nomen ad aliquid est, nec quisquam esse proximus nisi proximo potest."—i. 30.

"Æternum autem ardentius diligitur adeptum, quam desideratum; nulli enim desideranti conceditur plus de illo existimare, quam se habet, ut ei vilesat, quum minus invenerit; sed quantum quisque veniens existimare potuerit, plus perveniens inventurus est."—i. 38.

"Non enim, sicut primam syllabam Italiæ, quam brevem pronuntiaverunt veteres, voluit Virgilius, et longa facta est, ita quisquam potest efficere quum voluerit, ut ter terna aut non sint novem, aut non possint efficere quadratam figuram, aut non ad ternarium numerum tripla sint, ad senarium sescupla, ad nullum dupla, quia intelligibiles numeri semissem non habent."—ii. 38.

"Satis est ut adolescentulorum ista sit cura, nec ipsorum omnium, quos utilitati ecclesiasticæ cupimus erudiri, sed eorum, quos nondum magis urgens et huic rei sine dubio præponenda necessitas occupavit; quoniam si acutum et fervens adsit ingenium, facilius adhæret eloquentia legentibus et audientibus eloquentes, quam eloquentiæ præcepta sectantibus."—iv. 3.

"Sed nos etsi de literis eorum, quæ sine difficultate intelliguntur, nonnulla sumimus elocutionis exempla, nequaquam tamen putare debemus, imitandos eos nobis esse in eis, quæ ad exercendas et eliminandas quodammodo mentes legentium, et ad rumpenda fastidia, atque acuenda studia discere volentium, celandos quoque, sive ut ad pietatem convertantur, sive ut a mysteriis secludantur, animos impiorum utili ac salubri obscuritate dixerunt."—iv. 8.

"Ideo autem victoriæ est flectere, quia fieri potest ut doceatur, et delectetur, et non adsentiat. Quid autem illa duo proderunt, si desit hoc tertium? Sed neque delectare necessitatis est, quando quidem quum dicendo vera monstrantur, quod ad officium docendi pertinet, non eloquio agitur, neque hoc attenditur, ut vel ipsa, vel ipsum delectet eloquium, sed per se ipsa, quoniam vera sunt, manifestata delectant. Unde plerumque delectant etiam falsa patefacta atque convicta. Neque enim delectant, quia falsa sunt, sed quia falsa esse verum est, delectat et dictio, quia hoc verum esse monstratum est."—iv. 12.

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